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TECHNICAL INSPECTION REPORT.

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APPROVED:

F.X. Forest,
Captain, U.S.N.

(6) Operation Crossroads.

USS LST 133 -

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U.S.S. LST 133

SHIP CHARACTERISTICS

Building Yard: Chicago Bridge and Iron Co., Seneca, Illinois.

Commissioned: 29 November 1943.

HULL

Length Overall: 328 feet 0 inches.
Length on Waterline: 316 feet 0 inches.
Beam (extreme): 50 feet 0 inches.
Drafts at time of test: Fwd. 6 feet 2 inches.
Aft. 10 feet 0 inches.
Limiting displacement: 4,080 tons.
Displacement at time of test: 2,854 tons.

MAIN PROPULSION PLANT

Main Engines: Two General Motors Diesels, Type: 12 - 567 A. One per main shaft.
Reduction Gears: Type: "Falk" - Single reduction. One per engine.
Propellors: Two are installed in ship.
Main Shafts: Two are installed in ship.
Ships Service Generators: Three -100 KW. 230 volts - D.C. units are installed.

UNCLASSIFIED CONFIDENTIAL Security Information

[redacted] JOINT CHIEFS OF STAFF JCS 1776/36 DATED [redacted] APRIL [redacted]

Authority of [redacted] Date [redacted]

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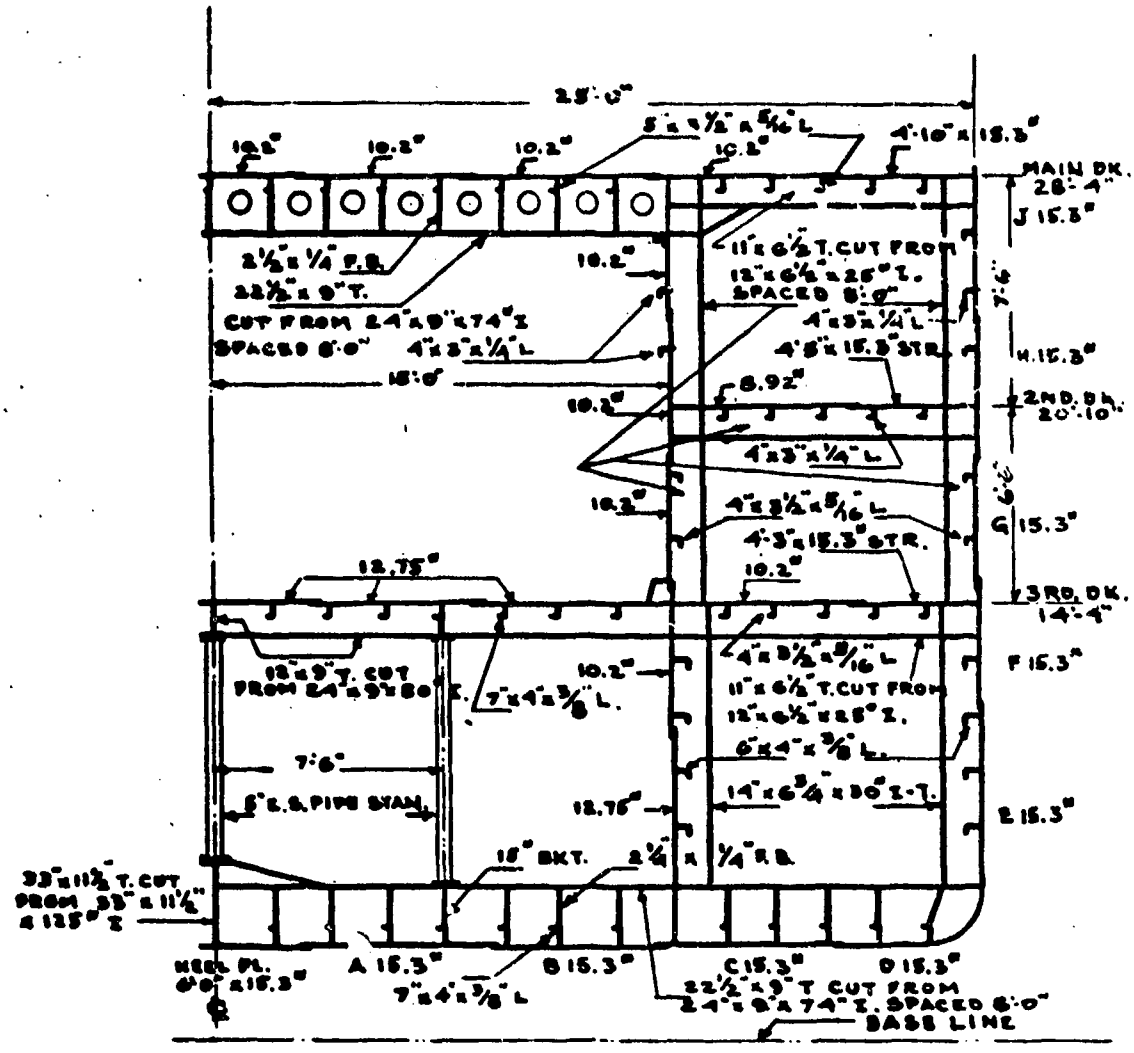


MIDSHIP SECTION

TEST B

SECTION

LST 133

9192

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

HULL

Drafts	Forward	Aft	List
Before Test B	7'6"	10' 6"	0
After Test B	8'6"	10' 0"	0

About 20 tons of water entered the tank space forward when the main deck was inundated. There is a small amount of drainage water in several second deck compartments. This combined with leakage at the rate of about four tons a day, probably through the stern tubes, has resulted in the above final drafts. A total of 100 tons of water has been taken aboard the ship.

The bilge control room, A-407ET, is completely flooded. Shock damage to two manifolds in A-407ET has made this space common with the adjacent wing ballast tanks, A-405W and A-406W, through a ballast line and all three common with the auxiliary machinery space, through a drainage line. The bilge control room flooded partially as a result of run-off from the two ballast tanks. Flooding into the three forward spaces continued as water drained from the auxiliary machinery space. The auxiliary machinery space, main machinery space and shaft alleys all flooded approximately five feet deep through failures in piping to adjacent ballast, fresh water, and diesel oil tanks.

MACHINERY

Both shaft alleys were completely flooded. The main engine room was flooded to about 9 inches above the lower level floor plates. The auxiliary engine room was flooded to about one foot above the lower level floor plates. The source of the water was undetermined. It may have entered the ship through the shaft glands.

ELECTRICAL

No comment.

(b) Structural Damage.

HULL

The superstructure plating and framing is undamaged. Light structure and equipment topside has been damaged seriously by the wave which inundated the vessel and by falling water. The main deck has suffered a panel deflection with about three inches permanent set and is dished locally between frames. The girders and end connections of the supporting structure are distorted. The elevator has been driven down to the tank deck, bending the side support lugs on the coaming and breaking the port lifting cable. The shell and interior structural bulkheads are generally intact. The interior compartments are a shambles of wrecked furniture and displaced equipment.

MACHINERY

No comment.

ELECTRICAL

No comment.

(c) Other damage.

HULL

The vessel's machinery and equipment have not been operated. Hull damage would have affected operability only slightly.

MACHINERY

Machinery of this vessel received severe damage from Test B. Much of it is probably beyond economical repair. All three diesel generator engines were thrown off their foundations and severely damaged. Main engine foundation bolts were loosened and the engines are probably out of alignment. Both ballast pumps were thrown off their foundations and badly damaged. Two of the four davit winches were severely damaged by foundation failures and are probably beyond repair. The elevator winch was considerably damaged, also by foundation failures. The elevator cable parted and the elevator platform fell to the tank deck. It is probably beyond repair. The machine shop lathe was knocked off its foundations and wrecked. There was a large amount of other less important damage.

ELECTRICAL

In addition to flooding damage to the ship's service switchboards, diesel generator sets and motors mounted in the auxiliary machinery was damaged by primary effects of the underwater burst.

1. Ship's service generators.
2. Ballast pumps in auxiliary machinery space.
3. Welin boat davit motors.
4. Elevator motor.
5. Gyro compass and repeaters.
6. Magnetic compasses.

7. Distribution panels.

8. Miscellaneous indicating equipment.

II. Forces Evidenced and Effects Noted.

(a) Heat.

HULL

There is no evidence of heat.

MACHINERY

No evidence.

ELECTRICAL

None observed.

(b) Fires and Explosions.

HULL

None.

MACHINERY

No evidence.

ELECTRICAL

None observed.

(c) Shock.

HULL

There was a strong underwater shock which exhibited an upward tendency. The entire hull is affected. Furniture is thrown about, equipment dislodged and several auxiliary machinery foundations failed. No ruptures are believed to have occurred, nor have any joint failures been observed in the exterior hull structure.

MACHINERY

Apparent direction; areas affected; critical scantlings; nature of joint failures (general); effect on machinery and equipment; significant behavior of structure or equipment.

The LST 133 received a very heavy underwater shock. This shock and the resultant whipping action of the vessel apparently caused all or nearly all of the damage mentioned above. There were numerous other evidences of heavy shock, such as furniture torn loose and thrown around, floor plates and gratings disarranged, etc.

ELECTRICAL

This vessel undoubtedly was subjected to a very strong shock wave. This shock wave was manifested by the following damage:

1. Ship's service generators displaced from foundations.

2. Ballast pumps cracked at foundation.

3. Starting batteries jumped out of battery racks.

4. Welin boat davit motors cracked at base.

5. Gyro compass gimbal mounting springs broken.

(d) Pressure.

HULL

There is no evidence of a pressure blast, but a wave flooded over the ship, doing considerable damage to light structures and equipment topside.

MACHINERY

Apparent direction (if any); areas affected; critical scantlings; general nature of failures; significant behavior of structure and equipment.

There is no direct evidence of pressure. However, some of the topside damage may have been caused by blast pressure, as well as the large mass of water thrown upon the vessel.

ELECTRICAL

None observed.

(e) Any effects apparently peculiar to the atom bomb.

HULL

Excluding the radio activity, the wave damage was the unique feature of the test.

MACHINERY

An underwater shock of this magnitude is apparently peculiar to the Atom Bomb.

ELECTRICAL

Coral sand found topside indicated that this vessel was inundated by a large mass of water. This water damaged some topside electrical equipment such as the starboard floodlight. This water was also a possible source of damage to the standard magnetic compass.

III. Results of test on target.

(a) Effect on propulsion and ship control.

HULL

Effect on propulsion unknown. One rudder is damaged but the other is apparently intact.

MACHINERY

The ship was left immobilized and without power of any kind by Test B. Temporary repairs are impracticable. Several months work at a naval shipyard would be required to restore her to normal operating condition. Much of her machinery is beyond repair.

ELECTRICAL

The damage to electrical equipment would have resulted in complete loss of electric power. Damage to main engine starting batteries probably would prevent starting the main engines. With loss of power, electric steering would be inoperative, and hand steering would have to be resorted to. Damage to the gyro compass and magnetic compasses would have seriously hampered ship navigation.

(b) Effect on gunnery and fire control.

HULL

MACHINERY

No comment.

ELECTRICAL

With loss of electric power, all electrically driven anti-aircraft guns and directors would have been inoperative. Hand pointing and firing would have been required.

(c) Effect on watertight integrity and stability.

HULL

Negligible.

MACHINERY

No comment.

ELECTRICAL

There was no visible indication that Test B had any effect on water-tight integrity and stability of this vessel from an electrical standpoint.

(d) Effect on personnel and habitability.

HULL

Personnel casualties would have been heavy. The habitability of the ship is seriously decreased.

MACHINERY

All personnel on this vessel would probably have been killed by shock and the effect of flying heavy objects all over the ship. Habitability was completely destroyed by loss of power, extensive damage and general disarrangement of the ship. In addition, radioactivity was very high when the ship was inspected 19 days after Test B.

ELECTRICAL

Electrical damage had a very great effect on habitability, since the loss of electric power would result in loss of lighting, ventilation, fresh water pumping facilities and cooking facilities.

(e) Total effect on fighting efficiency.

HULL

Fighting efficiency is reduced to about 50% due to main deck damage, elevator damage, and damage to interior equipment.

MACHINERY

Fighting efficiency was reduced to zero.

ELECTRICAL

Electrical damage had a very large effect on the fighting efficiency, since the loss of electric power would result in loss of power to guns, steering and deck machinery.

IV. General Summary of Observers' Impressions and Conclusions.

HULL

The hull proper stood up well under the attack but furniture, fittings, equipment and machinery, are severely damaged.

MACHINERY

This vessel might have been lost if she had been underway at sea at the time of the test.

ELECTRICAL

This vessel was subjected to a violent shock wave, apparently from the bottom of the vessel. This shock rendered the electric plant completely inoperative. It is considered that with suitable diesel generator mounting arrangements, modern navy motors and controllers, adequate protection against electrical damage from flooding, and suitable battery supports, this vessel would have withstood the underwater burst, from an electrical standpoint.

V. Preliminary Recommendations.

HULL

None.

MACHINERY

1. Studies should be made to improve the resistance of this type of naval machinery to shock.

2. The shock absorbing qualities of the foundations of the diesel generator engines on this vessel are inadequate to withstand a shock of this magnitude. They should be either improved or abandoned. It is noted that the main engine foundations, which are not of the shock absorbing type, withstood the test.

3. Machinery should not be 'stacked' vertically. On this vessel the motors of the davit winches are mounted on top of the clutches, these in turn on top of the speed reducers, which are on top of the winches. This arrangement appears to be very vulnerable to shock.

ELECTRICAL

It is recommended that electrical equipment mounted in the machinery spaces be afforded adequate protection against flooding. Supporting means for the gyro compass element should be made more resistant to shock. Battery racks should be modified to prevent dislodgement of the batteries under shock conditions. The design of shock or vibration mounts for diesel generator sets should be studied with the object of making them more resistant to heavy shock damage.

TECHNICAL INSPECTION REPORT

SECTION I - HULL

GENERAL SUMMARY OF HULL DAMAGE

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

Drafts	Forward	Aft	List
Before test B	7'6''	10'6''	0
After test B	8'6''	10'0''	0

About 20 tons of water entered the tank space forward when the main deck was inundated. There is a small amount of drainage water in several second deck compartments. This combined with leakage at the rate of about four tons a day, probably through the stern tubes, has resulted in the above final drafts. A total of 100 tons of water has been taken aboard. The bilge control room, A-407ET, is completely flooded. Shock damage to two manifolds in A-407ET has made it common with the adjacent wing ballast tanks, A-405W and A-406W, through a ballast line and also with the auxiliary machinery space through a drainage line. The bilge control room flooded partially as a result of run-off from the two ballast tanks. Flooding into the three forward spaces continued as water drained from the auxiliary machinery space. The auxiliary machinery space, main machinery space and shaft alleys all flooded approximately five feet deep through failures in piping to adjacent ballast, fresh water, and diesel oil tanks.

(b) Structural damage.

The superstructure plating and framing is undamaged. Light structure and equipment topside has been damaged seriously by the wave which inundated the vessel and by falling water. The

main deck has suffered a panel deflection with about three inches permanent set and is dished locally between frames. The girders and end connections of the supporting structure are distorted. The elevator has been driven down the tank deck, bending the side support lugs on the coaming and breaking the port lifting cable. The shell and interior structural bulkheads are generally intact. The interior compartments are a shambles of wrecked furniture and displaced equipment.

(c) Other damage.

The vessel's machinery and equipment have not been operated. Hull damage would have affected operability only slightly.

II. Forces Evidenced and Effects Noted.

(a) Heat.

There is no evidence of heat.

(b) Fires and explosions.

None.

(c) Shock.

There was a strong underwater shock which exhibited an upward tendency. The entire hull is affected. Furniture is thrown about, equipment dislodged and several auxiliary machinery foundations failed. No ruptures are believed to have occurred and no joint failures have been observed in the exterior hull structure.

(d) Pressure.

There is no evidence of a pressure blast, but a wave flooded over the ship, doing considerable damage to light structures and equipment topside.

(e) Any effects apparently peculiar to the atom bomb.

Excluding the radioactivity, the wave damage was a unique feature of the test.

III. Results of test on target.

(a) Effect on propulsion and ship control.

Effect on propulsion unknown. One rudder is damaged but the other is apparently intact.

(b) Effect on gunnery and fire control.

Not applicable.

(c) Effect on watertight integrity and stability.

Negligible.

(d) Effect on personnel and habitability.

Personnel casualties would have been heavy. The habitability of the ship is decreased about 50%.

(e) Total effect on fighting efficiency.

Fighting efficiency is reduced to about 50% due to main deck damage, elevator damage, and damage to interior equipment.

IV. General Summary of Observers' Impressions and Conclusions.

The hull proper stood up well under the attack but furniture, fittings, equipment and machinery, are severely damaged.

V. Preliminary Recommendations.

None.

VI. Instructions for loading the vessel specified the following:

ITEM	LOADING
Diesel oil	10%
Ammunition	Not specified
Potable and reserve feed water	As desired
Salt water ballast	As desired

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ship's force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

DETAILED DESCRIPTION OF HULL DAMAGE

A. General Description of Hull Damage.

(a) The overall condition of the hull structure is good but the equipment, furniture, fittings, etc., within the hull are damaged and dislodged by the underwater shock and by the severe tidal wave which inundated the vessel.

(b) (c) The principal item of hull damage is the panel deflection of the main deck as a result of water taken aboard from the tidal wave. The maximum permanent deflection is about three inches at the centerline. Scratch gage records indicate a total movement of about six inches.

(d) The two machinery spaces have flooded one foot above the floor plates as a result of piping failures. The shaft alleys have about four and a half feet of water. The bilge control room, A-407-E, has flooded completely through a damaged drain line to the auxiliary machinery space. About 20 tons of water have been taken into the tank space through the hatches.

(e) The longitudinal strength of the vessel is not appreciably affected, but the ability of the main deck to carry deck loads has been sharply decreased. Reserve buoyancy is decreased about 100 tons. Hull damage had little apparent effect on the operability of the vessel.

B. Superstructure.

(a) (b) There is no damage to any of the strength members of the superstructure. Light fittings and construction are broken and distorted by the water that passed completely over the ship. The light framing of the flag bag and wind screen on top of the navigation bridge deck house are seriously distorted and twisted to port. Ready service boxes are torn from their connections and thrown forward. The gyro compass repeater has been torn from its stand and carried forward and down to the navigation bridge deck. Dogged doors in the deck houses were probably opened by the shock, allowing water to enter. This is evidenced by the destruction of a joiner bulkhead at frame 36 starboard, main deck, (photograph

4220-5, page 88 and further evidenced by the presence of water and fine coral in the interior of the deck house. The starboard and port signal yardarms of the main mast are bent forward. Superstructure plating and gun bulwarks suffered no apparent damage.

(c) There is no evidence of fire in the superstructure.

(d) No estimate of relative effectiveness against heat and blast of shapes and plates.

(e) There is no constructive criticism of the design of structural components of the superstructure.

C. Turrets, Guns and Directors.

(a) There are no protected mounts installed on this ship.

(b) The unprotected mounts consist of 20 and 40mm guns. The mounts are operable but have been drenched by the salt water and coral which washed over the ship. There is no shelter provided for the gun crews operating these guns and in all probability the casualties would have been numerous.

(c) Condition of directors and range finders or of the instruments therein was not determined.

(d) The only constructive criticism to be offered is that more adequate shelter for gun crews should be provided.

D. Torpedo Mounts, Depth Charge Gear.

(a) Not applicable.

E. Weather Deck (Main Deck).

(a-b) The main deck recorded an even deflection downward between frames 13 to 34 with a maximum permanent deflection estimated to be 3'' amidships on the centerline. Local wrinkling of the deck plating occurred between the framing as seen on photograph 4218-9, page 89. This damage is evidence of overloading

of the deck by the water which fell on and washed over it. The ship girder is apparently intact. The strength of the main deck has undoubtedly been decreased and the usual loading, stowage of an LST, would be dangerous.

(c) As a result of the shock that the ship must have received and the sweeping wave that passed over it, the chain and pipe railings on the port and starboard side are distorted and bent. (photograph 4219-4, page 93). Life rafts and ready service boxes are torn from their positions and scattered about the deck.

The elevator has been driven down to the tank top, bending the side support lugs on the coaming and breaking the lifting cable on the port side, as seen in photograph 4218-2, page 94. The edge of the platform is bent and torn where it has been forced over the support lugs and transverse wrinkling is evident in the plating (photograph 4218-1, page 97). A failure in the foundation of the motor which operates the elevator seems to be the result of shock. This failure caused the displacement of the gears shown in photograph 4218-12, page 96.

Vent heads of the tank deck exhaust system are distorted and several have been carried away, but the system is still operable. Failure of the welds in the lap joint of a vent head is shown in photograph 4218-10, page 91. An "I" beam strong back for securing the after cargo hatch cover sheared its end connection and was carried aft and up to the navigating bridge, (photograph 4219-5, page 92).

F. Exterior Hull (Above Waterline).

The exterior hull plating above the waterline appears to be in good condition. An examination of the hull where accessible from the interior shows no indications of strain in the stiffening members. The hull is punctured locally a few feet below the deck edge on the port side at about frames 32 to 34. This damage appears to be collision damage suffered during the initial boarding. All exterior hull fittings appear to be in good condition.

G. Interior Compartments (Above Waterline).

(a) These compartments comprise all those on the third deck and second deck. All structural bulkheads and decks are undamaged, with the following exceptions:

1. In the tank deck space, the overhead is dished about 3" maximum and is dished locally between transverse and longitudinal beams.

2. The transverse deck girders under the main deck are deflected due to dishing of the deck. The deflection is accompanied by some distortion of the girders and by distortion of the connecting brackets.

3. The transverse hatch girders of the cargo hatch are slightly bowed and have suffered minor crippling where the girders are bracketed to the tank space bulkheads. Photograph 4219-10, page 103, shows the distortion of the bracket on the starboard side of frame 28. Photograph 4219-11, page 99, shows the condition of the underside of the main deck.

(b) Joiner bulkheads are generally intact except locally where furniture or equipment have been thrown against the bulkheads with force.

(c) Access closure and fittings are generally undamaged but several doors and hatches have been undogged and opened by shock. There is evidence of a strong shock wave which had an upward tendency. Photograph 4220-4, page 106, shows an excellent example. The access hatch on the third deck at frame 45, centerline, leading to C-418M was undogged and thrown upward by shock. Shock lifted the ladder above so that the ladder finally came to rest on the opened under-face of the hatch. A quick acting scuttle to the flooded bilge control room on the port side, frame 12 1/2, was also opened by shock and the violent roll of the vessel.

(d) Equipment and furniture is badly damaged in all compartments. Furniture is wrecked, lockers and bunks are thrown down and equipment stowed on bulkheads has been torn loose and thrown to the deck. Photograph 4218-9, page 89, shows disarrangement of equipment in the tank space.

(e) There is no evidence of fire.

(f) There is no apparent damage to structure in way of piping, cables, ventilation ducts, etc.

(g) The effect on watertight integrity is minor and consists of several undogged hatches and doors. Habitability and utility of compartments is reduced by damage to equipment and furniture.

H. Armor Decks and Miscellaneous Armor.

Not applicable.

I. Interior Compartments (Below Waterline).

(a) The majority of compartments below the waterline are tanks or void spaces and are reported under Item K. Damage to the remainder is as follows:

1. The bilge control room was pumped down and inspection made. The boundaries of the compartment are intact. The source of flooding has been found to be two manifolds which are cracked as a result of shock. The clean ballast manifold is cracked so that the clean ballast lines from A-405W and A-406W are open into the bilge control room. The port drainage manifold is also cracked, allowing water from the auxiliary machinery space to drain to the bilge control room. A stop-check valve in the auxiliary machinery space prevents flow in the opposite direction.

2. The auxiliary engine room, B-401ET, and the machinery space, B-406ET, have been pumped. The structure appears to be intact and structural foundations for machinery are undamaged. Piping failures in diesel oil, fresh water, and ballast lines accounted for the flooding which reached a height of about one foot above the floor plates.

3. The shaft alleys, C-405ET, C-406ET, C-416E and C-419E are flooded to an average depth of about four and a half feet. Source of the flooding is not apparent. No damage to structure is evident.

4. C-418M is dry and undamaged. Cans of ammunition have been thrown about by shock.

5. C-419M is undamaged.

(b) No damage to joiner bulkheads.

(c) Hatches leading to the above spaces are undamaged.

(d) Equipment is generally dislodged by shock but otherwise appears to be undamaged.

(e) Flooding.

See Item "L".

(f) Damage to piping is discussed in sub-item (a) and Item "L". No other damage was observed in this category.

(g) After dewatering all damaged spaces would be useable.

J. Underwater Hull

(a) Since nearly all spaces contiguous to the shell are tanks or contained water, no visual inspection of the hull is possible. It is possible that structural damage due to underwater shock occurred, but it is doubtful that any plating has been ruptured. Some water may have entered through failures around sea chests and other hull openings.

(b) The vessel has taken aboard about 100 tons of water. This increased the draft and decreased the freeboard about 3". The effect of hull damage on operability is slight. Maneuverability would have been hampered by damage to the port rudder.

(c) 1. Shafts and propellers appeared to be intact.

2. No damage to struts known of or suspected.

3. The starboard rudder appears to be intact and in a fore and aft position. The port rudder is swung outboard about 30°, probably against the limit stops. The rudder indicator in the steering engine room does not show this position. The port rudder is probably inoperable.

4. Skegs appear to be undamaged.

(d) Details of impairment of keel structure.

No data, but no damage suspected.

K. Tanks.

(a) All ballast tanks were filled before test. Soundings after test indicate that a total of approximately 20 tons of ballast leaked from A-410W, A-411W, A-413W, A-415W, and A-416W through leaky valves into the clean ballast line and thence to the bilge control room through a cracked manifold. A-404W was inspected and found to be full and intact. The forward voids were sounded and found to be dry. Tanks aft were not sounded. Piping damage in the machinery spaces and the presence of oil and water in these spaces indicate that considerable run off occurred in the after tanks. No structural damage is suspected.

(b) It is not known what tanks are contaminated. There is considerable oil in the water in the two machinery spaces, indicating damage of some kind (probably to piping) in surrounding tanks. The effect of tank damage on operability is not known.

(c) Damage (known or suspected) to torpedo defense systems.

Not applicable.

L. Flooding.

(a-b) Drafts before test were 7'6" forward and 10'6" aft.

Drafts after test were 8'6" forward and 10'0" aft.

Drafts after test were taken when the vessel had reached an equilibrium about two weeks after test. Approximately 100 tons of water have been taken aboard. There is about 20 tons of water in the tank space which entered through the elevator opening. The bilge control room, A-407ET, is completely filled, with a small amount of overflow into the Bos'n stores, A-308-A. The auxiliary and main machinery spaces are flooded to about one foot above the engine room floor plates. The shaft alleys contain about 4 1/2 feet of water. The total amount of water in normally dry spaces greatly exceeds the amount of water taken aboard as indicated by the drafts. Investigation revealed the following probable sequence of flooding. The clean ballast manifold in A-407ET is cracked, allowing ballast tanks A-405W and A-406W to drain into the bilge control room. A-404W is not affected. About 20 tons of water has leaked from tanks A-410W, A-411W, A-413W, A-415W, and A-416W into the clean ballast lines and thence to the bilge control room. The port drainage manifold in the bilge control room is cracked, allowing water from the auxiliary machinery space to drain to the bilge control room through the drainage line. A stop-check valve prevents flooding from the bilge control room to the machinery spaces. Immediately after the explosion, it is probable that the main and auxiliary machinery spaces flooded from the surrounding ballast and fuel oil tanks through piping failures similar to those in the bilge control room. The commanding officer reports that all fuel, fresh and salt water lines to generators are broken. The drafts indicate that flooding in the after spaces came from within the ship. There was apparently little change in drafts immediately after the test. In the two weeks following the test, the vessel went down slowly by the bow. Any flooding into the hull through stern tubes or leaking sea-connections

aft was transmitted through the drainage line to the bilge control room, equalizing the level in the two portions of the ship. When inspected, the bilge control room and ballast tanks A-405W and A-406W were completely flooded. The rate of flooding was less than 4 tons per day over the two week period.

(c) Since nearly all flooding is within the vessel through piping failures, it is believed that all spaces could have been dewatered by the crew.

M. Ventilation.

(a) Damage to topside ventilation equipment is covered in Item "K". Ventilation ducts in the interior showed poor resistance to shock. Straps and joints failed, allowing sections of ducting to drop or distort.

(b) There is no evidence that the ventilation system conducted heat, blast, fire or smoke, below decks.

(c) Progressive flooding did not take place through the ventilation system although some water entered through the open heads on the main deck.

(d) It is suggested that hoods with closed tops but open sides be installed on the vent heads.

N. Ship Control.

(a) The damaged condition of the wheel house and navigating bridge, as described under item "B", would have rendered the ship inoperable from this station. The telegraph system, steering indicator, and compass are destroyed. This condition is seen in photograph 4220-6, page 87 .

The steering gear machinery was visually inspected and no damage is apparent. The port rudder is forced 30° to port but this movement does not record on the indicator in the steering gear room.

(b) Constructive criticism of ship control systems.

No comment or criticism.

O. Fire Control.

Not applicable.

P. Ammunition Behavior.

(a) Two ready service boxes mounted on the after side of the superstructure gun tubs at frame 45 have been displaced from their normal location. One is missing and the other dropped to the d[illegible]k below. Its sunshields are torn and the box is racked severely. There is no damage to the ammunition.

(b) There is no structural damage to the magazines. Cans of 40mm ammunition are thrown about by the shock. No explosions ensued.

(c) List of stowages which are insufficiently protected and effects o[illegible]hip survival of explosion of each stowage.

None.

Behavior of gasoline stowage facilities.

Not applicable.

Q. Ammunition Handling.

Not applicable.

R. Strength.

(a) There is no evidence of permanent hog or sag.

(b) There is no evidence of shear strains in the hull.

(c) There are no failures due to racking stresses.

(d) As described in item C, the transverse hatch girders on the midship hatch show a tendency to distort at the point where the bracket joins the girder. Photograph 4219-10, page 103, shows the damage to the girder at frame 28, starboard side.

(e) There is no panel deflection as the result of blast. The main deck was a panel deflection of about 3" due to the weight of water taken aboard as shown in photograph 4218-9, page 99, and discussed in item E.

(f) Several electric motor foundations suffered shock fractures. A complete inspection of these items was not made. Further data is contained in the machinery and electrical reports.

TECHNICAL INSPECTION REPORT

SECTION II - MACHINERY

GENERAL SUMMARY OF MACHINERY DAMAGE

I. **Target Condition After Test.**

(a) **Drafts after test; list; general areas of flooding, sources.**

Both shaft alleys were completely flooded. The main engine room was flooded to about 9 inches above the lower level floor plates. The auxiliary engine room was flooded to about one foot above the lower level floor plates. The source of the water was undetermined. It may have entered the ship through the shaft glands.

(b) Structural damage.

No comment.

(c) Damage, machinery and ship control.

Machinery of this vessel received severe damage from test B. Much of it is probably beyond economical repair. All three diesel generator engines were thrown off their foundations and severely damaged. Main engine foundation bolts were loosened and the engines are probably out of alignment. Both ballast pumps were thrown off their foundations and badly damaged. Two of the four davit winches were severely damaged by foundation failures and are probably beyond repair. The elevator winch was considerably damaged, also by foundation failures. The elevator cable parted and the elevator platform fell to the tank deck. It is probably beyond repair. The machine shop lathe was knocked off its foundations and wrecked. There was a large amount of other less important damage.

II. Forces Evidenced and Effects Noted.

(a) Heat.

No evidence.

(b) Fires and explosions.

No evidence.

(c) Shock.

The LST 133 received a very heavy underwater shock. This shock and the resultant whipping action of the vessel apparently caused all or nearly all of the damage mentioned above. There were numerous other evidences of heavy shock, such as furniture torn loose and thrown around, floor plates and gratings disarranged, etc.

(d) Pressure.

There is no direct evidence of pressure. However, some of the topside damage may have been caused by blast pressure and the large mass of water thrown upon the vessel.

(e) Any effects apparently peculiar to the atom bomb.

An underwater shock of this magnitude is apparently peculiar to the atom bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

The ship was left immobilized and without power of any kind by test B. Temporary repairs are impracticable. Several months work at a naval shipyard would be required to restore her to normal operating condition. Much of her machinery is beyond repair.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on watertight integrity and stability.

No comment.

(d) Effect on personnel and habitability.

All personnel on this vessel would probably have been killed by shock and the effect of flying heavy objects all over the ship. Habitability was completely destroyed by loss of power, extensive damage and general disarrangement of the ship. In addition, radioactivity was very high when the ship was inspected 19 days after test B.

(e) Total effect on fighting efficiency.

Fighting efficiency was reduced to zero.

IV. General Summary of Observers' Impressions and Conclusions.

This vessel might have been lost if she had been underway at sea at the time of the test.

V. Any Preliminary General or Specific Recommendations of the Inspecting Group.

1. Studies should be made to improve the resistance of this type of naval machinery to shock.

2. The shock absorbing qualities of the foundations of the diesel generator engines on this vessel are inadequate to withstand a shock of this magnitude. They should be either improved or abondoned. It is noted that the main engine foundations, which are not of the shock absorbing type, withstood the test.

3. Machinery should not be "stacked" vertically. On this vessel the motors of the davit winches are mounted on top of the clutches, these in turn on top of the speed reducers, which are on top of the winches. This arrangement appears to be very vulnerable to shock.

DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

The machinery in general was badly damaged by shock. All three diesel generator engines were thrown off their foundations and severely damaged, probably beyond repair. Main engine foundation bolts were loosened. These engines are probably out of alignment. The heating boiler is inoperable because of damaged accessories. Both ballast pumps, the elevator, and the two forward Welin davits are inoperable. The machine shop lathe was wrecked. There was considerable minor damage.

(b) Areas of major damage.

Major damage is largely concentrated in the auxiliary engine room and topside. Some major damage not discovered by visual inspection probably exists elsewhere.

(c) Primary causes of damage.

Underwater shock and resulting whipping motion of the ship was the principal cause of damage to machinery.

(d) Effect of target test on overall operation of machinery plant.

The ship was made inoperable by test B. Loss of the diesel generator engines left her without any electric power or light. The main engines are probably out of alignment and inoperable. Most of the deck machinery cannot be operated even if power were available. It is estimated that personnel casualties would have been very heavy.

Note: Considering the heavy shock received by this ship, it is believed that a great deal of damage exists that could not be determined by visual inspection. No facilities were available for

opening machinery or attempting operation, and time aboard was severely limited by radiological hazard.

B. Boilers.

1. Inoperable because of damage to accessories.

2. The boiler itself appeared from visual inspection to be undamaged. However, it is quite probable that the heavy shock caused leaky joints.

3. Some of the boiler accessories appear to have moved due to shock. For example the attached fuel oil pump was definitely moved by shock and is inoperable. This makes the boiler inoperable until the fuel pump is repaired.

C. Blowers, Forced Draft.

The forced draft blower for the heating boiler is apparently undamaged.

D. Fuel Oil Equipment.

1. The fuel oil pump for the heating boiler was knocked out of alignment and was made inoperable by the shock.

2. The fuel oil piping connected thereto shows no evidence of damage.

E. Boiler Feedwater Equipment.

Not inspected.

F. Main Engines.

1. The engine room was flooded to about 9 inches above the lower level floor plates. The source of this water was not determined.

2. The cover plates of the main diesel engine valves were knocked off the engines and lay on the gratings. A picture, 2983-4, page 107, was taken showing the starboard engine (outboard) cover plates laying on the floor plates.

3. The shock loosened the engine foundation bolts.

4. The bolts securing the reduction gears were not loosened. Attention is invited to the fact that the diameter of the engine foundation bolts (which were loosened by the blast) is about 3/4'' while the reduction gear foundation bolts are about 1 1/4'' in diameter.

5. No other damage to the main engines was noted. However, this was a visual inspection and it is possible that some misalignment took place. Internal damage may also exist.

G. Reduction Gears (Main Diesel Engines).

Visual inspection shows no apparent damage.

H. Shafting and Bearings.

1. Not inspected due to flooding.

2. The starboard and port shaft alleys were completely flooded, and there may be shock damage. There certainly is secondary damage due to flooding.

I. Lubrication System.

The lubricating systems on the main diesel engines are not damaged. However, the lubricating oil systems for the auxiliary engines are damaged as described under Item "U" below.

J. Condensers and Air Ejectors.

Not applicable.

K. Pumps.

1. The ballast pump, port side, in the auxiliary engine room was knocked over and lay on its side. The cast iron foundation casing supporting the motor was cracked off. A picture, 2948-10, page 118, showing the damage was taken.

2. The starboard side ballast pump in the same compartment was also damaged. The cast iron foundation cracked at the flange facing supporting the motor.

3. There is no apparent damage to the other independent pumps from visual inspection. Attached pumps are considered with their main components.

L. Auxiliary Generators (Turbine and Gears).

Not applicable.

M. Propellers.

Visual inspection from the water surface shows no evidence of any damage.

N. Distilling Plant.

The outer casing of the forward evaporator set was knocked off. There was no other breakage. However, it is believed that the heavy shock has caused misalignment and probably leaks in the evaporator units and their accessories.

O. Refrigerating Plant.

1. The cover plate of the freezer was knocked off and lay on the deck about 6 feet from the box.

2. The motor, compressor, piping, etc., show no evidence of breakage, but the heavy shock may have caused damage which is not visually apparent.

P. Winches, Windlasses, Capstans, and Davits.

1. Winches.

(a) This vessel has five winches, four of these are used with the four Welin davits and one with the tank deck elevator, (the tank deck elevator is called "tank deck ramp" on later classes of LST's). In this report winches will be referred to as "No. 1 davit winch etc." according to the equipment with which they are associated.

(b) No's 1 and 2 davit winches and the elevator winch are inoperable and beyond repair by the ship's force. Emergency repairs to the elevator winch could be made by a tender in about one day, but not to the davit winches. Nos. 2 and 3 davit winches appear to be operable.

(c) Details of damage to winches.

(1). Foundations and bed plates.

There was a crack in the bedplate of the tank deck elevator motor on the after side.

(2) Motors and other electrical equipment.

The clutch casing which supports the motor of the #1 davit winch (photographs 4209-1, page 135 and 2991-12, page 108) broke and the motor fell onto the deck.

On No. 2 davit winch the clutch casing was cracked all the way around near its base, throwing the motor out of alignment (photograph 4209-2, page 136).

On #3 davit winch the limit switch was knocked off. As this is only a safety feature, the winch would

be operable without it (photograph 4209-3, page 137).

The feet of the tank deck elevator winch motor broke off at the speed reducer end. At the other end of the motor the tack welding securing it to the plate bracket (which rests on the bedplate and supports the motor)broke away. The motor and speed reducer as a unit fell aft, and downward at the reducer end, (photographs 2991-10, page 133 and 2991-11, page 134).

(3) Brakes and brake lining.

No apparent damage.

(4) Gearing and clutches.

The clutch of #1 davit winch is badly distorted and probably binding (see par. 1 (c) 2 above for damage to the casing) (photographs 4209-1, page 135 and 2991-12, page 108).

The clutch of #2 davit winch is doubtless out of alignment. (See par. 1 (c) 2 above for damage to casing).

The gear and pinion of the elevator winch are about 6 inches apart as a result of the falling of the speed reducer (see par. 1 (c) 2 above). The gears themselves appear to be undamaged.

There is no apparent damage to gears or clutches.

(5) Hydraulic system.

Not applicable.

(6) Drums, bearings, shafting, etc.

Except for misalignment incident to damage described above these appear to be in normal condition. It is probable that there is internal damage to bearings affected by the damage described above.

(7) Fittings, wildcats, etc.

No apparent damage.

2. Windlass.

No apparent damage.

3. Capstan.

Not applicable.

4. Davits.

The davits themselves appear to be undamaged. Nos. 1 and 2 davits are inoperable because of damage to the winches described above.

Q. Steering Engine.

1. Apparently undamaged.

2. There is no evidence of breakage, however, the heavy shock sustained by the ship may have caused misalignment and other damage not visually apparent.

R. Elevators, Ammunition Hoists, Etc.

The tank deck elevator (called a "ramp" on later classes of LST's) is inoperable because of damage to the winch (see item P). The elevator cables parted. The platform dropped to the tank deck and is approximately 10 feet to starboard of its proper position. It is beyond repair by the ship's force. (See photograph 2991-9, page 109).

S. Ventilation (Machinery).

There is no evidence of breakage on vent blowers, motors, foundations, and ducts, however, the heavy shock sustained by the ship may have caused damage not visually apparent.

T. Air Compressors.

Not observed.

U. Diesels (Generators and Boats).

1. The diesel generator engines are severely damaged. Details of the damage are given below.

(a) The auxiliary engine room was flooded to about one foot above the floor plates.

(b) All three engines were thrown up about one foot, and came down about six inches forward of their original position. It is probable that the shock has caused internal damage to the engines.

(c) The engine gage boards attached to the engines were knocked out of position. The shock left most of the gages in a damaged and inoperable condition. The gage lines from the engines to the panel boards are broken or torn loose.

(d) Practically all of the fuel lines attached to the engines are damaged. The lines were pulled loose from their connections. The brackets alongside the engine, supporting the fuel oil lines, gage lines, and fuel oil filters were knocked loose.

(e) The salt water cooling lines were damaged incident to the breaking loose of the engines. The line to one engine was completely broken off.

(f) The fresh water pipes to the starboard and center engines were damaged incident to the breaking loose of the engines. The lines were broken at the screwed joints.

(g) The exhaust lines from the engines were damaged by the engines being thrown upward against them. Part of the lagging was knocked off, and it is believed that the lines are no longer gastight.

(h) Most of the breathers were knocked off the engines, and lay on the deck.

(i) The foundations were of the shock absorbing type, spring supported. The holding down bolt threads were stripped, and the springs actually assisted in throwing the engines vertically upward.

(j) Most of the severe damage described above is attributed to the failure of the vibro-dampers supporting the engine to restrain the vertical motion imparted to the engine by underwater shock. If the units had been solidly mounted this damage would have been much less severe.

2. The following photographs show damage to the generator engines:

(a) Starboard generator engine gauge board looking aft, 2948-12, page 110.

(b) Starboard generator engine showing broken flexible tubing on salt water and fresh water piping, 2984-12, page 111.

(c) Starboard generator engine showing broken bracket supporting gauge lines, fuel oil lines fuel oil filter and broken gauge lines, 2983-1, page 112.

(d) Generator engine exhaust pipe damaged by engine being thrown upward against it, 2984-4, page 113.

(e) Port side generator room looking inboard showing generator engine fuel oil flexible pipes torn loose, 2984-2, page 114.

(f) Center generator engine showing damage to exhaust pipe, 2984-6, page 115.

V. Piping.

(a) Main steam.

Not applicable.

(b) Auxiliary steam.

No apparent damage.

(c) Auxiliary exhaust.

Not applicable.

(d) Condensate and feedwater.

No apparent damage.

(e) Fuel.

1. No apparent damage to main piping.

2. The damage to fuel lines connected to the diesel generator engines is discussed under item "U".

(f) Lubricating Oil.

Main lines not damaged. For lube oil piping to main and generator engines, see items "F" and "U".

(g) Firemain, sprinkling and water curtain.

No apparent damage.

(h) Condenser circulating water.

Not applicable.

(i) Drains.

No apparent damage.

(j) Compressed air.

Not observed.

(k) Hydraulic.

Not applicable.

(l) Gasoline.

Not applicable.

(m) Miscellaneous.

Damage was sustained by pipe lines connected to the diesel generator engines. The damage is described under item "U".

W. Miscellaneous.

1. Installed galley and laundry equipment is apparently undamaged. Portable articles were thrown around by the shock.

2. The lathe in the machine shop was thrown over and lay on the deck. The tail-stock and lathe supporting leg were broken off. The lathe was originally standing fore and aft against the inboard bulkhead of the machine shop. It was thrown outboard to starboard side, head-stock pointing outboard. Photographs 2983-6, page 116 and 2983-7, page 117, show the lathe as found during inspection. The lathe is probably beyond repair.

TECHNICAL INSPECTION REPORT

SECTION III - ELECTRICAL

GENERAL SUMMARY OF ELECTRICAL DAMAGE

I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

Not observed.

(b) Structural damage.

Not observed.

(c) Damage.

In addition to flooding damage to the ship's service switchboards, diesel generator sets and motors mounted in the auxiliary machinery space, the following electrical equipment was damaged by primary effects of the underwater burst.

1. Ship's service generators.
2. Ballast pumps in auxiliary machinery space.
3. Welin boat davit motors.
4. Elevator motor.
5. Gyro compass and repeaters.
6. Magnetic compasses.
7. Distribution panels.
8. Miscellaneous indicating equipment.

II. Forces Evidenced and Effects Noted.

(a) Heat.

None observed.

(b) Fires and explosions.

None observed.

(c) Shock.

This vessel undoubtedly was subjected to a very strong shock wave. This shock wave was manifested by the following damage:

1. Ship's service generators displaced from foundations.
2. Ballast pumps cracked at foundation.
3. Starting batteries jumped out of battery racks.
4. Welin boat davit motors cracked at base.
5. Gyro compass gimbal mounting springs broken.

(d) Pressure.

None observed.

(e) Any effects apparently peculiar to the atom bomb.

Coral sand found topside indicated that this vessel was inundated by a large mass of water. This water damaged some topside electrical equipment such as the starboard floodlight. This water was also a possible source of damage to the standard magnetic compass.

III. Effects of Damage.

(a) Effect on electrical equipment and ship control.

The damage to electrical equipment would have resulted in complete loss of electric power. Damage to main engine starting batteries probably would prevent starting the main engines. With loss of power, electric steering would be inoperative, and hand steering would have to be resorted to. Damage to the gyro compass and magnetic compasses would have seriously hampered ship navigation.

(b) Effect on gunnery and fire control.

With loss of electric power, all electrically driven anti-aircraft guns and directors would have been inoperative. Hand pointing and firing would have to be resorted to.

(c) Effect on watertight integrity and stability.

There was no visible indication that test B had any effect on watertight integrity and stability of this vessel from an electrical standpoint.

(d) Effect on personnel and habitability.

Electrical damage had a very great effect on habitability, since the loss of electric power would result in loss of lighting, ventilation, fresh water pumping facilities and cooking facilities.

(e) Effect on fighting efficiency.

Electrical damage had a very great effect on the fighting efficiency, since the loss of electric power would result in loss of power to guns, steering and deck machinery.

IV. General Summary of Observers's Impressions and Conclusions.

This vessel was subjected to a violent shock wave, apparently from the bottom of the vessel. This shock rendered the electric plant completely inoperative. It is considered that with suitable diesel generator mounting arrangements, modern navy motors and controllers, adequate protection against electrical damage from flooding, and suitable battery supports, this vessel would have withstood the underwater burst, from an electrical standpoint.

V. Any Preliminary General or Specific Recommendations of the Inspecting Group.

It is recommended that electrical equipment mounted in the machinery spaces be afforded adequate protection against flooding. Supporting means for the gyro compass element should be made more resistant to shock. Battery racks should be modified to prevent dislodgement of the batteries under shock conditions. The design of shock or vibration mounts for diesel generator sets should be studied with the object of making them more resistant to heavy shock damage.

DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage.

(a) Overall condition.

The electric plant on this vessel was completely inoperative due to the severe damage to the three auxiliary diesel generator sets, and associated starting batteries.

(b) Areas of major damage.

The auxiliary engine room, the gyro compass room, and superstructure received the most electrical damage.

(c) Primary causes of damage in each area of major damage.

The extreme underwater shock that this vessel experienced was the primary cause of damage on this vessel. The secondary damage was received by partial flooding of the auxiliary engine room.

(d) Effect of target tests on overall operation of electric plant.

Due to the severe damage to the auxiliary diesel generator sets, the electric plant on this vessel would be completely inoperative. In addition, the main propulsion engine would have been inoperative due to the damage to the main propulsion engine starting battery.

(e) Types of equipment most affected.

Auxiliary diesel generator sets, gyro compass, topside auxiliary machinery, magnetic compass and portable storage batteries were the types of equipment most affected by the underwater shock.

B. Electric Propulsion Rotating Equipment.

Not applicable.

C. Electric Propulsion Control Equipment.

Not applicable.

D. Ship's Service Generator.

Due to the failure of the auxiliary diesel generator set vibration mounts, all three units were displaced from their foundations. Miscellaneous pipe lines and fittings were ruptured on the diesels, causing units to be inoperative. Although the generator sets were not tested, there was no visible indication that any electrical damage other than flooding was sustained. It should be noted that the solidly mounted propulsion diesel engines were not damaged. Photographs 2984-1, page 125 and 2984-5, page 128, show damage to the diesel generator sets.

Recommendations.

(a) It is recommended that the design of vibration or shock mounts be studied for future designs, with the object of improving their shock resistance.

(b) The diesel generator sets should be mounted as high as practicable in the auxiliary engine room, and the units made watertight up to the bearings. Since damage control personnel can no longer be counted upon for immediate flooding control work, it is considered essential that maximum protection against flooding be incorporated into equipment design and installation.

E. Emergency Generators.

Not applicable.

F. Switchboards and Distribution Panels.

The ship's service switchboard was damaged due to the flooding of the auxiliary engine room. Two lighting distribution panels manufactured by the Square D Company had their outer cases damaged when the securing screws for the front door failed. One panel was mounted in the auxiliary engine room on the starboard side, and one panel was mounted in the machine shop. Photograph 2984-3, page 127, shows damage to the panel in the auxiliary engine room and photograph 2983-8, page 122, shows damage to the panel in the machine shop.

The power panel mounted in the mess hall, compartment C-205-EL was torn from the bulkhead, and the panel was on the deck.

Recommendations.

Considering the flooding experienced in the auxiliary machinery space, and the likelihood that damage control personnel will not be immediately available to control this flooding, it is considered essential that the switchboard on this vessel be moved up out of the hold. Since there is inadequate head room in the auxiliary machinery space to raise the switchboard, it probably will be necessary to relocate the switchboard up out of the machinery space, to afford maximum protection against flooding.

It is considered that modern Navy distribution panels would have withstood the underwater shock.

G. Wiring, Wiring Equipment and Wireways.

Although a general movement of cables and wireways was noted, no damage to wireway supports was observed.

H. Transformers.

The balancer coils on the ship's service generators were not damaged.

I. Submarine Propelling Batteries.

Not applicable.

J. Portable Batteries.

Portable storage batteries mounted in the main engine room, auxiliary machinery space, gyro compass room, and battery charging shop jumped out of their racks, damaged battery cases, and broke jumper connections. Photograph 2983-3, page 120, shows damage to the battery rack in main engine room; photograph 2984-8, page 129 and 2984-11, page 132, show damage to batteries and battery racks in auxiliary engine room; photograph 2983-12, page 126, shows damage to battery rack in gyro compass room; photograph 2983-9, page 123, shows damage to battery rack in the battery charging shop.

Recommendations.

(a) It is recommended that some means be provided to secure batteries in their racks, so they will not be dislodged under shock conditions.

(b) The securing device should be an integral part of the battery rack to insure the batteries will be secured at all times.

K. Motors, Motor Generator Sets and Motor Controllers.

The following damage to motors and motor controllers was noted:

(a) Two vertical ballast pumps mounted in the auxiliary machinery space had their cast iron pedestals between the pump and motor broken. The port pump was completely torn off its base and was lying on the deck, while the starboard pump only had its pedestal cracked. Photograph 2948-10, page 118, shows the damage to the port ballast pump.

(b) Feet of the speed reducer and of the elevator motor broke off at a point approximately on the diameter of the holding down bolt hole. The plate bracket holding the motor end parted at the weld. The unit was intact, but adrift. Damage is shown in photographs 2991-10, page 133 and 2991-11, page 134.

(c) The vertical motor for the after port welin boat davit was cracked at the base. Photograph 4209-2, page 136, shows this damage.

(d) The motor of the forward starboard welin boat davit was broken off immediately above the holding down bolts at the lower side of the clip case. Damage is shown in photographs 2991-12, page 108 and 4209-1, page 135.

(e) The limit switch on the after starboard welin boat davit broke the bolting lug of the lower end and sheared the holding bolt at the upright. The damage is shown in photograph 4209-3, page 137.

(f) The fire and bilge pump motor controller, manufactured by the General Electric Company, Serial No. CR-5820-B32A, had its arc chutes dislodged from their mountings.

(g) The fuel oil purifier motor controller, manufactured by the General Electric Company, Serial No. CR-5820-B32S, had the armature for one line contactor dislodged. This damage is shown in photograph 2984-10, page 131.

The motors mounted in the auxiliary engine room were damaged from the flooding of that space.

Discussion and Recommendations.

It is considered that the modern Navy type motors and motor controllers would have withstood the underwater shock in far better shape than the commercial equipment that was installed on this vessel.

Careful consideration must be given to the flooding problem encountered on these vessels. In the case of this particular vessel, the pumps and machinery auxiliaries mounted in the auxiliary engine room were flooded out. The loss of these pumps would have greatly hampered damage control work under actual battle conditions. Since damage control personnel can no longer be counted on for immediate flooding control work, it is considered essential that maximum protection against flooding be incorporated into this equipment. Accordingly it is recommended:

(a) Vital motors and motor controllers, i.e. those units essential to the damage control and fighting efficiency of the vessel which must be mounted in the machinery spaces should be of the submersible type.

(b) These units should be arranged for remote operation from same location which will have some protection against flooding.

L. Lighting Equipment.

Numerous rough service lamps were broken throughout the vessel. No special area of damage to lamps was observed.

The starboard floodlight on the pilot house level was bent over, glass broken and lamp blown out. This damage was probably caused by the large wave that inundated the vessel.

Recommendations.

Damage to lamps on this vessel indicated that high impact type lamps or rough service lamps with shock mounts should be installed.

M. Searchlights.

No damage observed.

N. Degaussing Equipment.

No damage observed.

O. Gyro Compass Equipment.

The Sperry Mark XIV Mod. 2 gyro compass had all its gimbal mounting springs stretched or broken. The rubber buffers were dislodged from the gimbal ring, and the cover was knocked off the gyro. Photograph 2983-11, page 124, shows this damage.

The Sperry Mark XV gyro compass repeater on the flying bridge dropped out of its gimbal support. Photograph 4209-5, page 139, shows this damage.

The binnacle stand for the standard magnetic compass mounted on the signal bridge was broken a short distance below the compass support. The top of the binnacle with the compass dropped to the deck. Photograph 4209-4, page 138, shows this damage.

Magnetic compass in the pilot house had its gimbal mount sprung and the compass dropped in the binnacle. Photograph 2983-5, page 121, shows this damage.

Recommendations.

(a) It is recommended that the gyro element supporting mechanism be made more resistant to shock.

(b) Gimbal rings for magnetic compasses and gyro repeaters should be modified so that the equipment being supported cannot jump out under shock.

(c) The binnacle stand for the magnetic compass should be strengthened. The compasses should be located in a more protected area to reduce their vulnerability to damage.

P. Sound Powered Telephones.

The sound powered telephones that were mounted on non-locking type hooks were dislodged.

Recommendation.

All sound powered telephones should be installed on locking type hooks to reduce the likelihood of damage.

Q. Ship's Service Telephone.

Not applicable.

R. Announcing Systems.

No damage observed.

S. Telegraphs.

The engine order telegraph in the pilot house had its glass broken. Photograph 4209-8, page 141, shows this damage.

T. Indicating Systems.

The R.P.M. indicator on the main engine gauge board was dislodged from the board when the phenolic mounting ring broke. This damage is shown in photograph 2983-2, page 119.

The low pressure lube oil, alarm horn in the auxiliary machinery space was dislodged due to failure of the cast iron mounting lugs. Photograph 2984-9, page 130, shows this damage.

The cease firing horn for the after port 40 mm gun tub was knocked off its mounting when the mounting bolts broke.

Recommendations.

(a) Main gauge board instruments should be enclosed in metal cases. These instruments should be designed to conform to the high shock requirements of electrical instruments.

(b) The use of cast iron for horns and alarms should be discontinued.

(c) Horns mounted on the weatherdeck should be installed in protected locations or faired into the superstructure.

U. I.C. and A.C.O. Switchboards.

Not applicable.

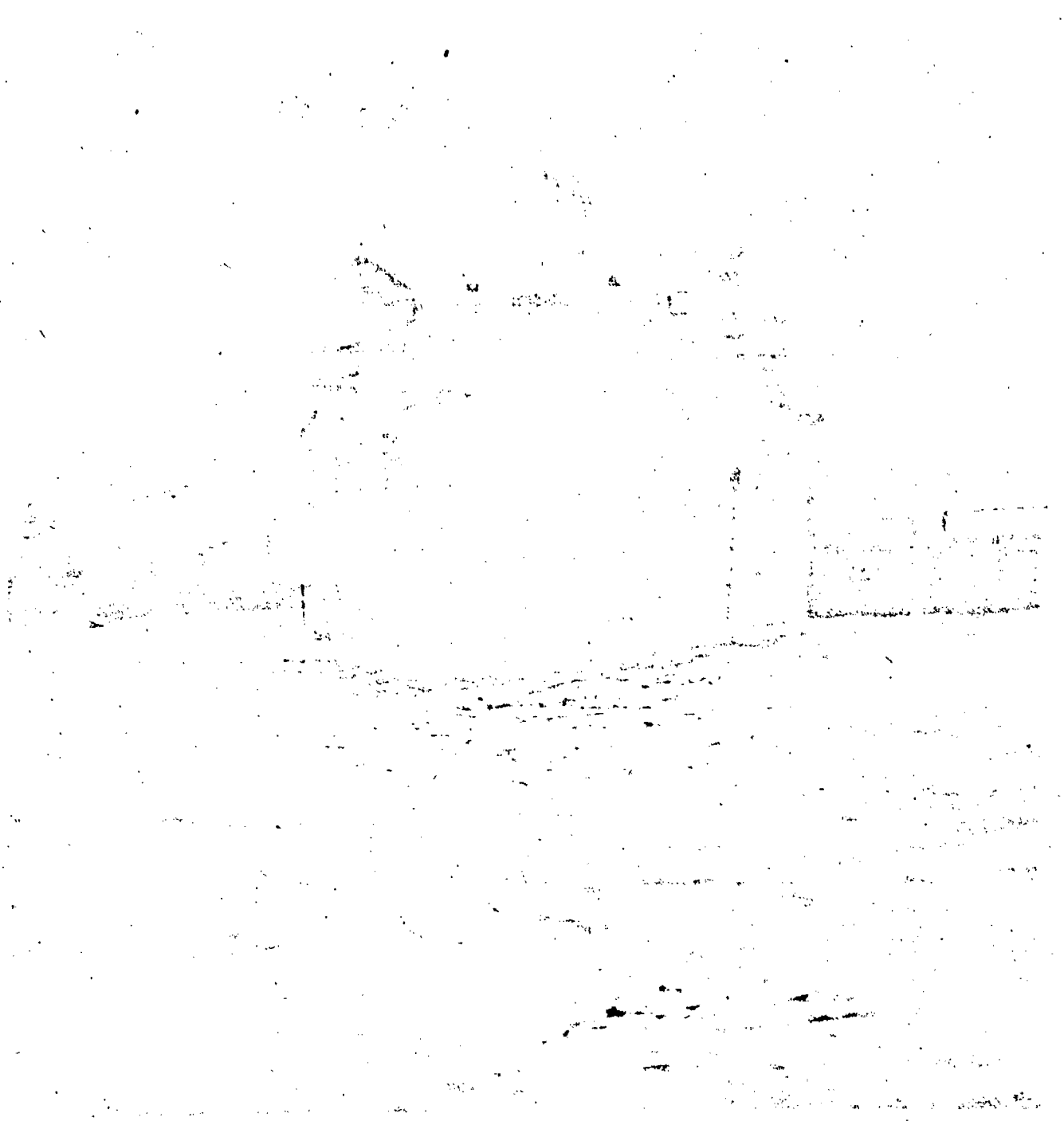
V. F.C. Switchboards.

Not applicable.

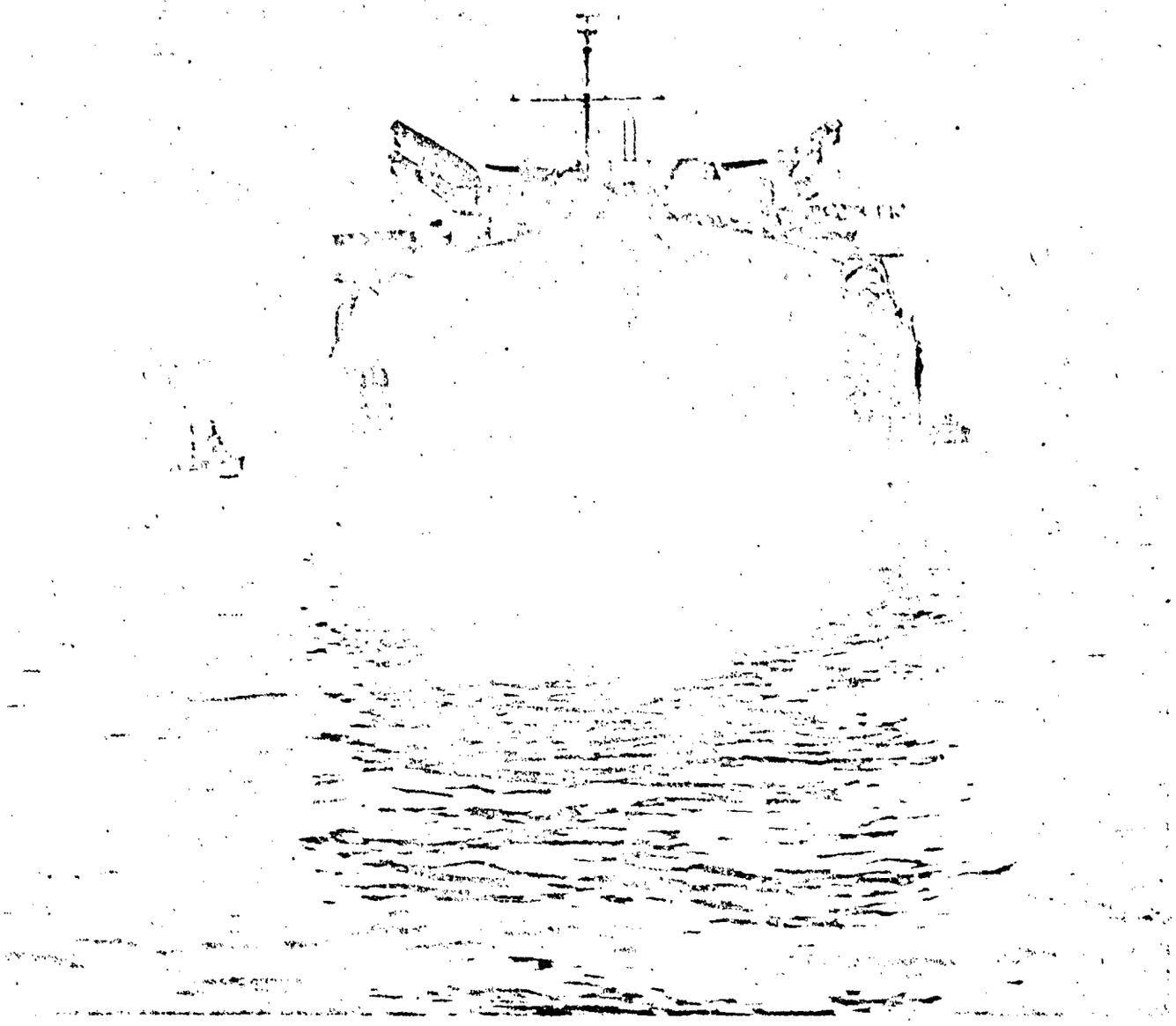
SECTION IV

PHOTOGRAPHS

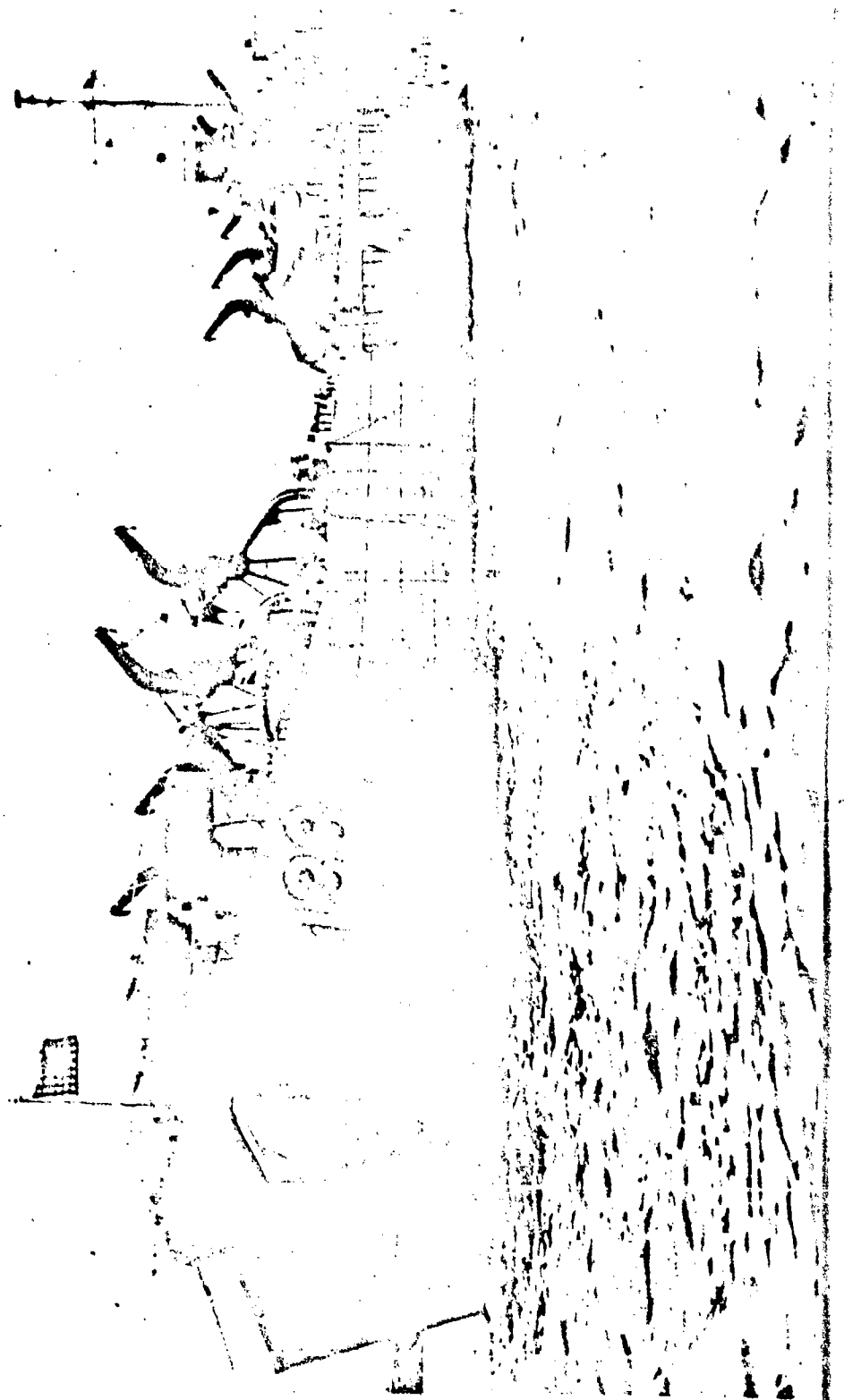
TEST BAKER



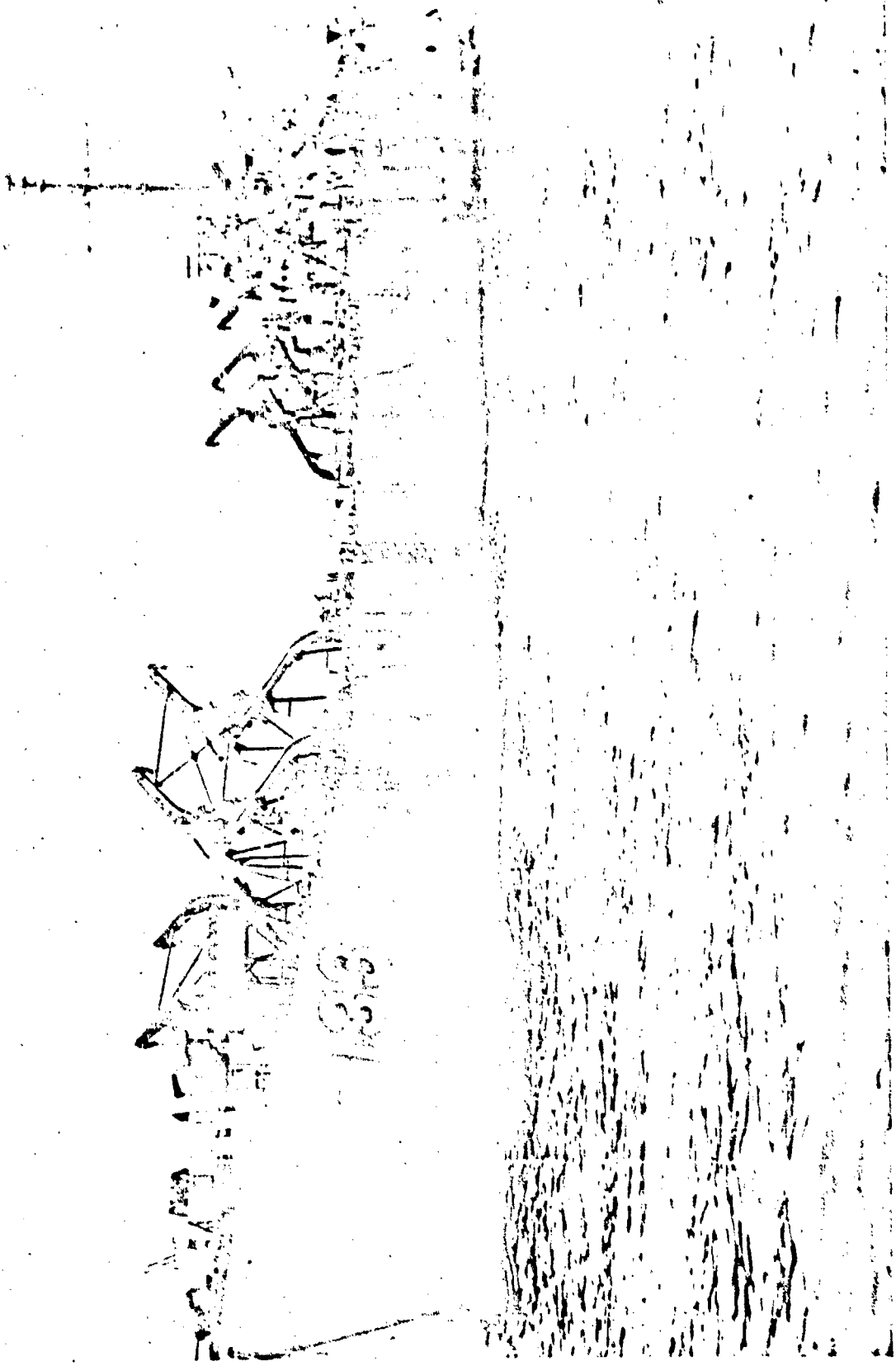
BB-CR-227-519-5. Bow before Test B.



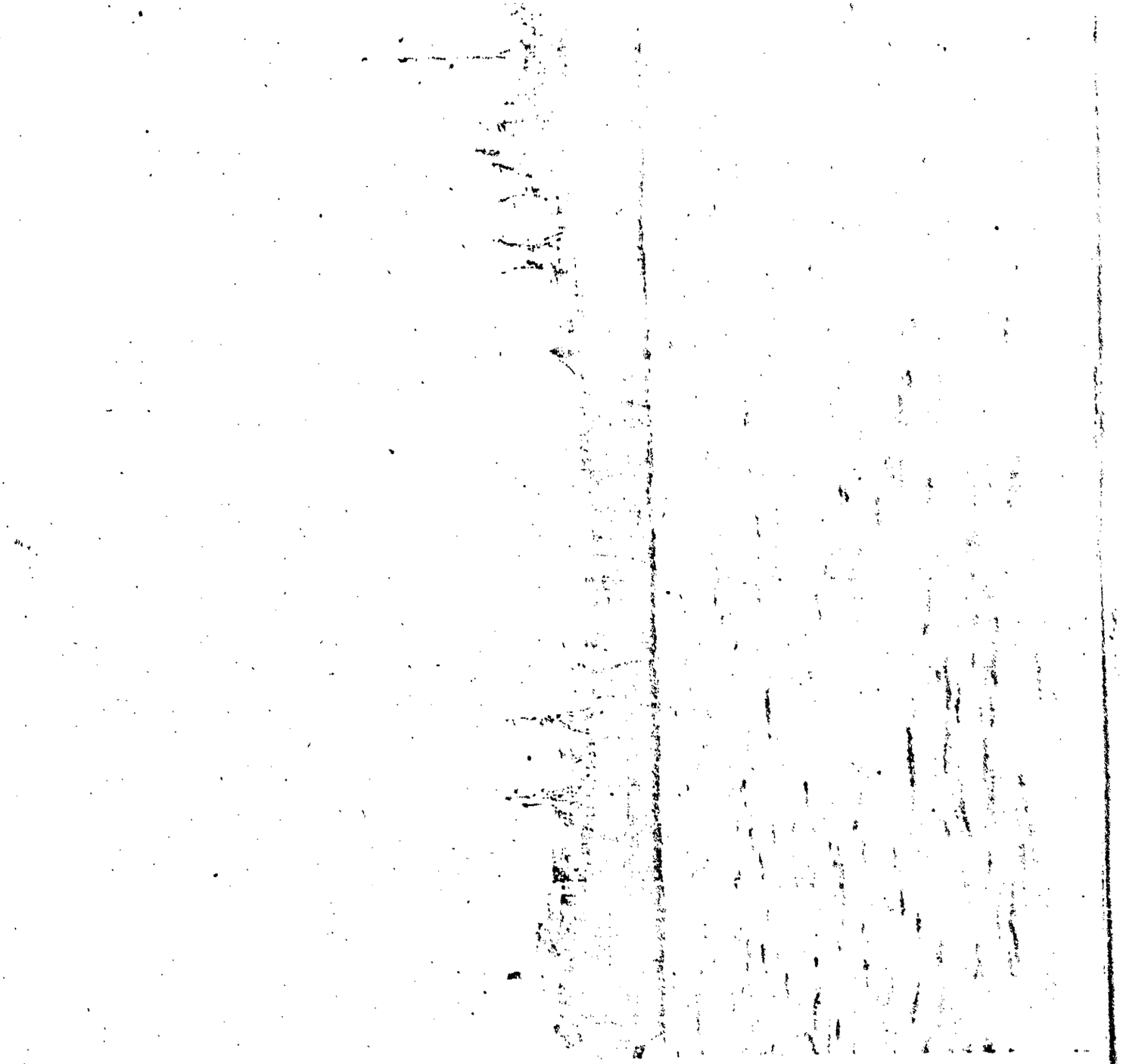
AB-CR-227-289-98. Bow after Test B.



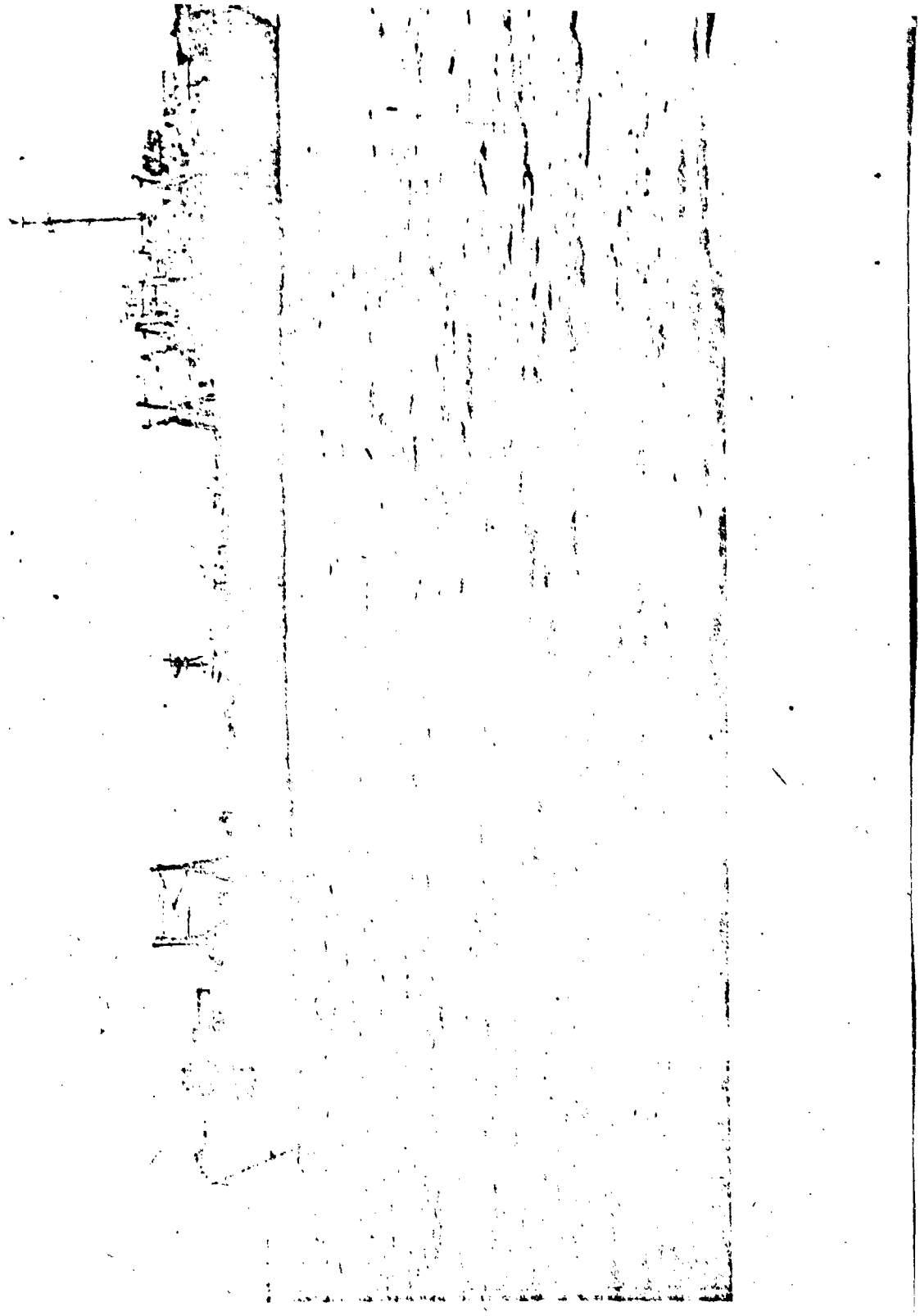
BB-CR-227-519-6. Port bow before Test B.



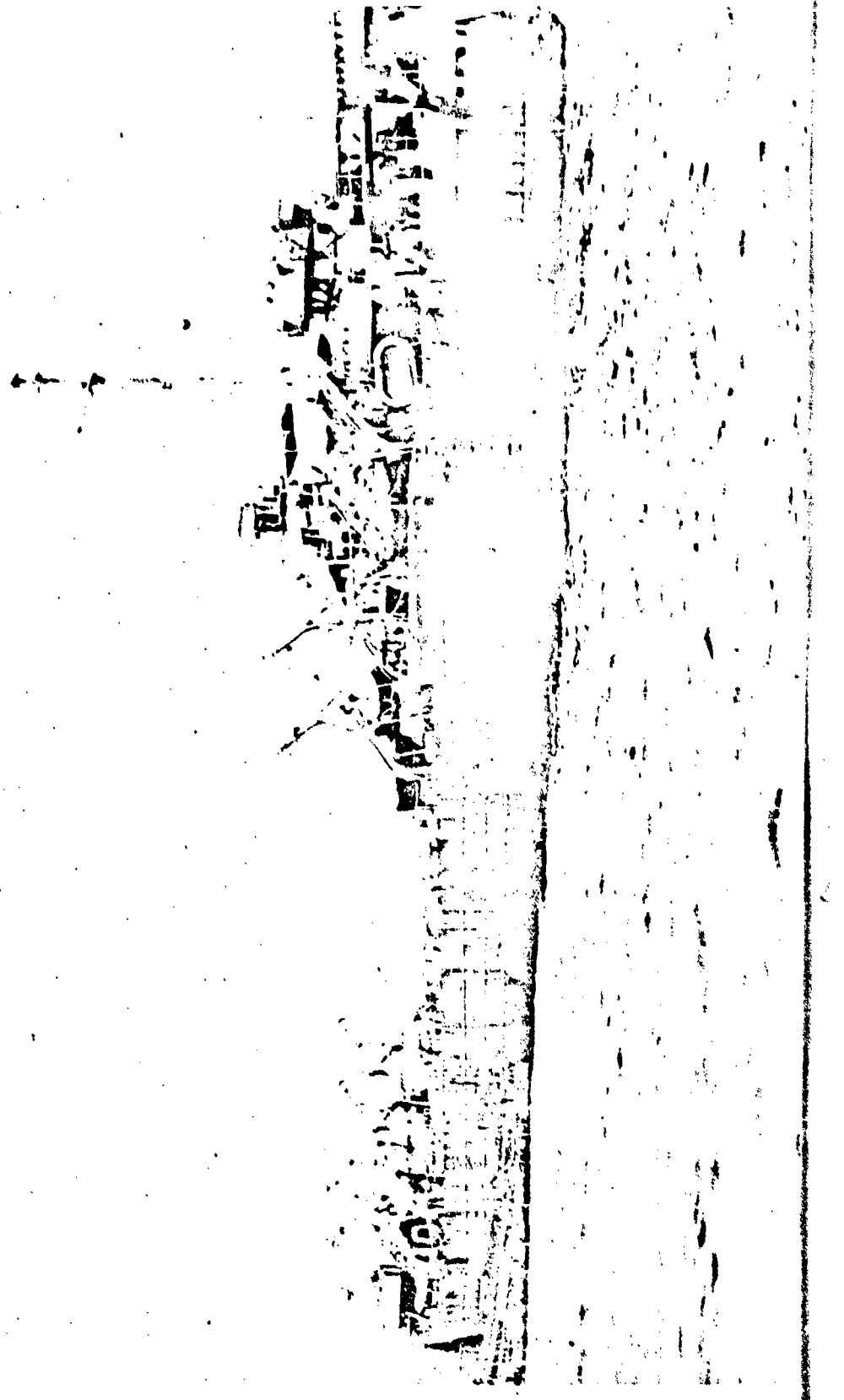
AB-CR-227-289-105. Port bow after Test B.



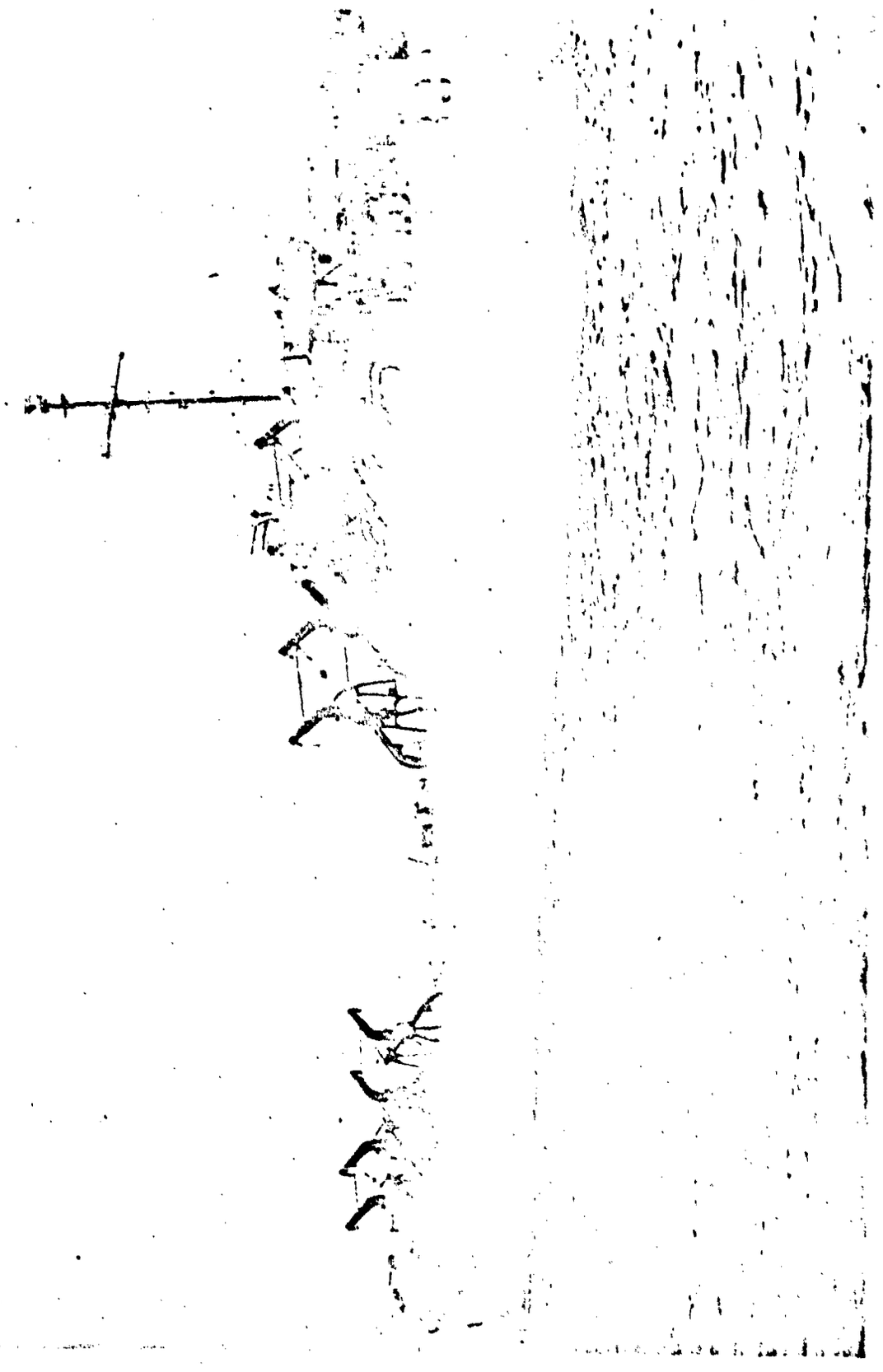
BB-CR-227-519-7. Port beam before Test B.



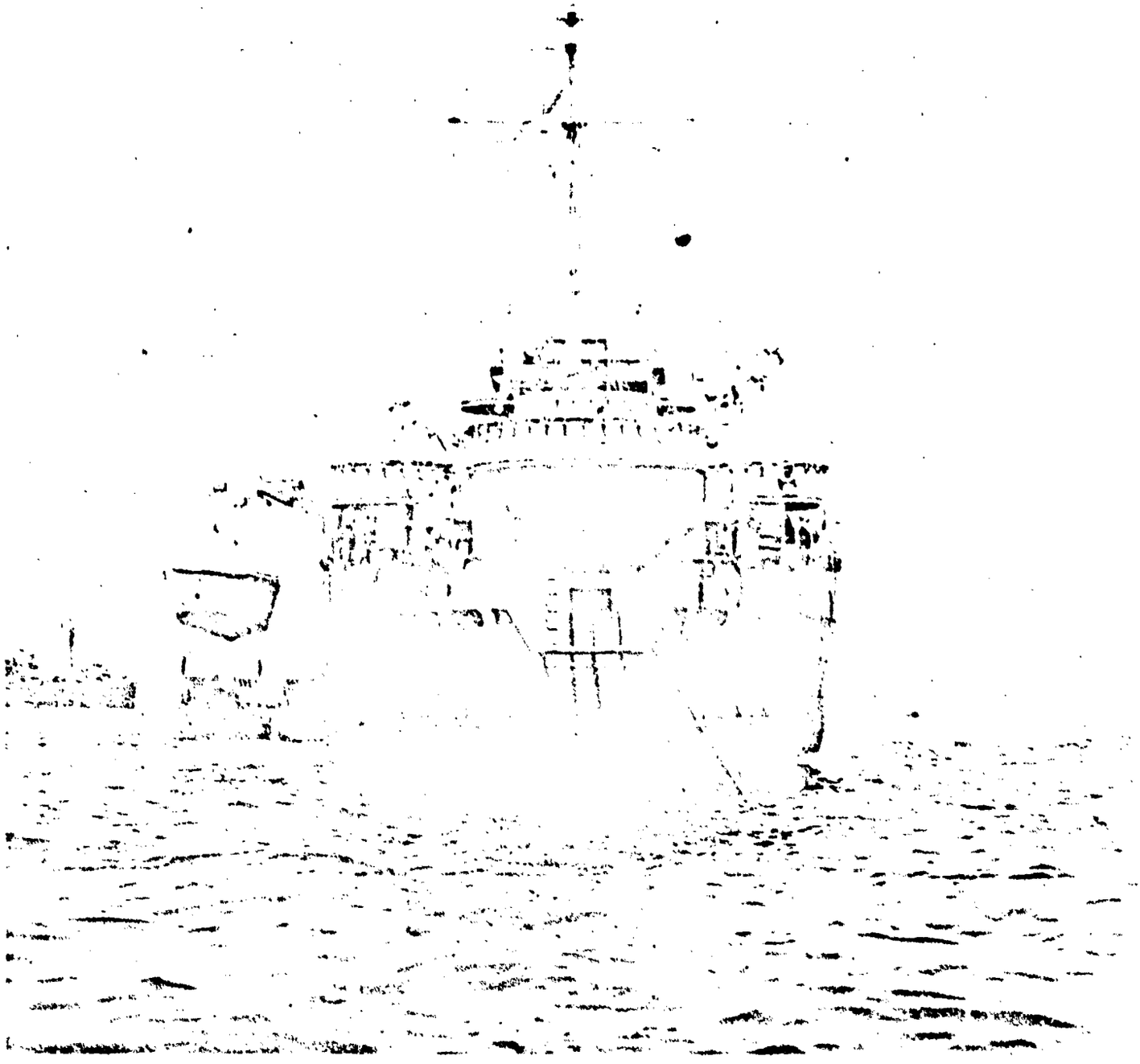
AB-CR-227-289-104. Port beam after Test B.



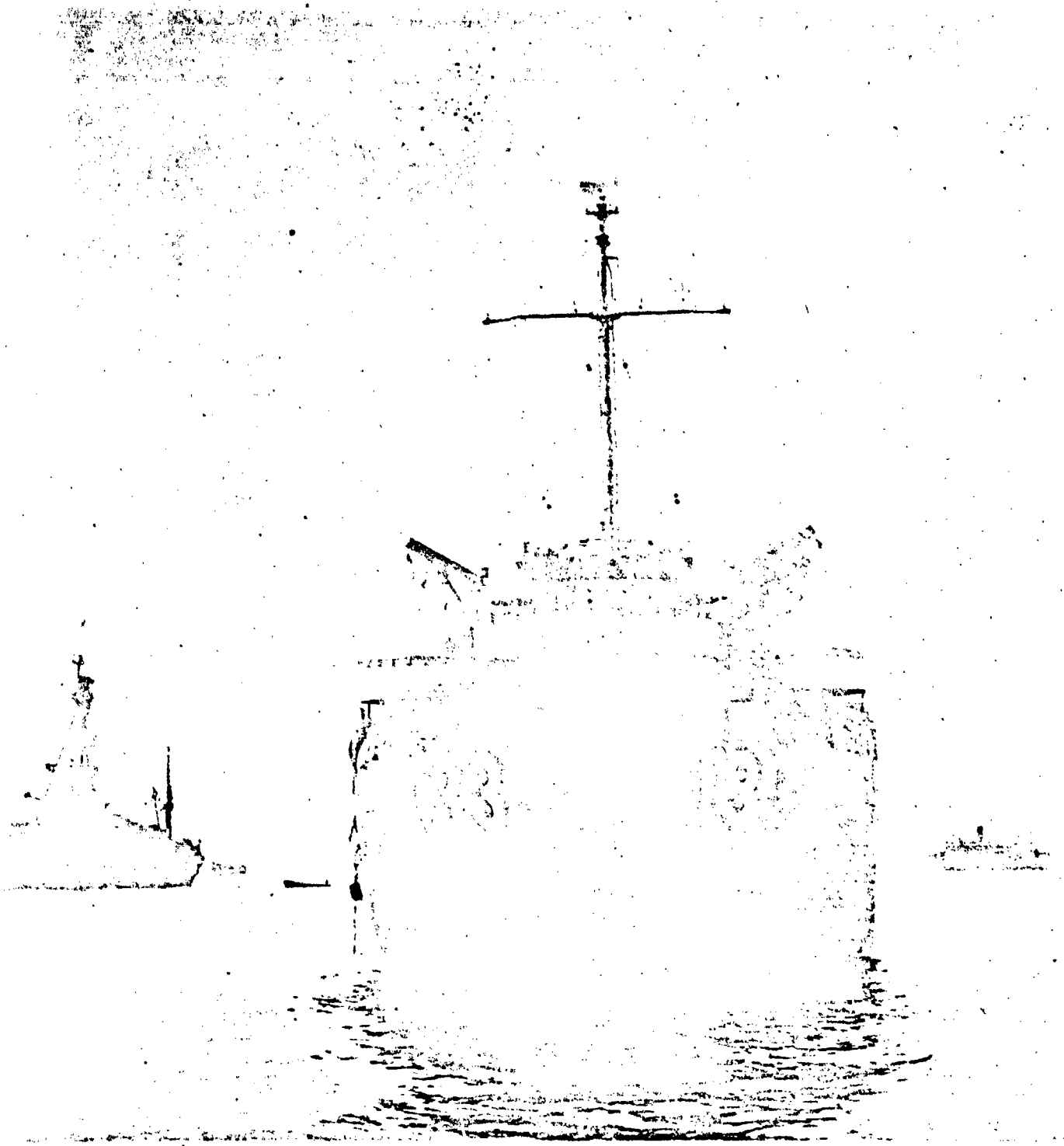
BB-CR-227-519-8. Port quarter before Test B.



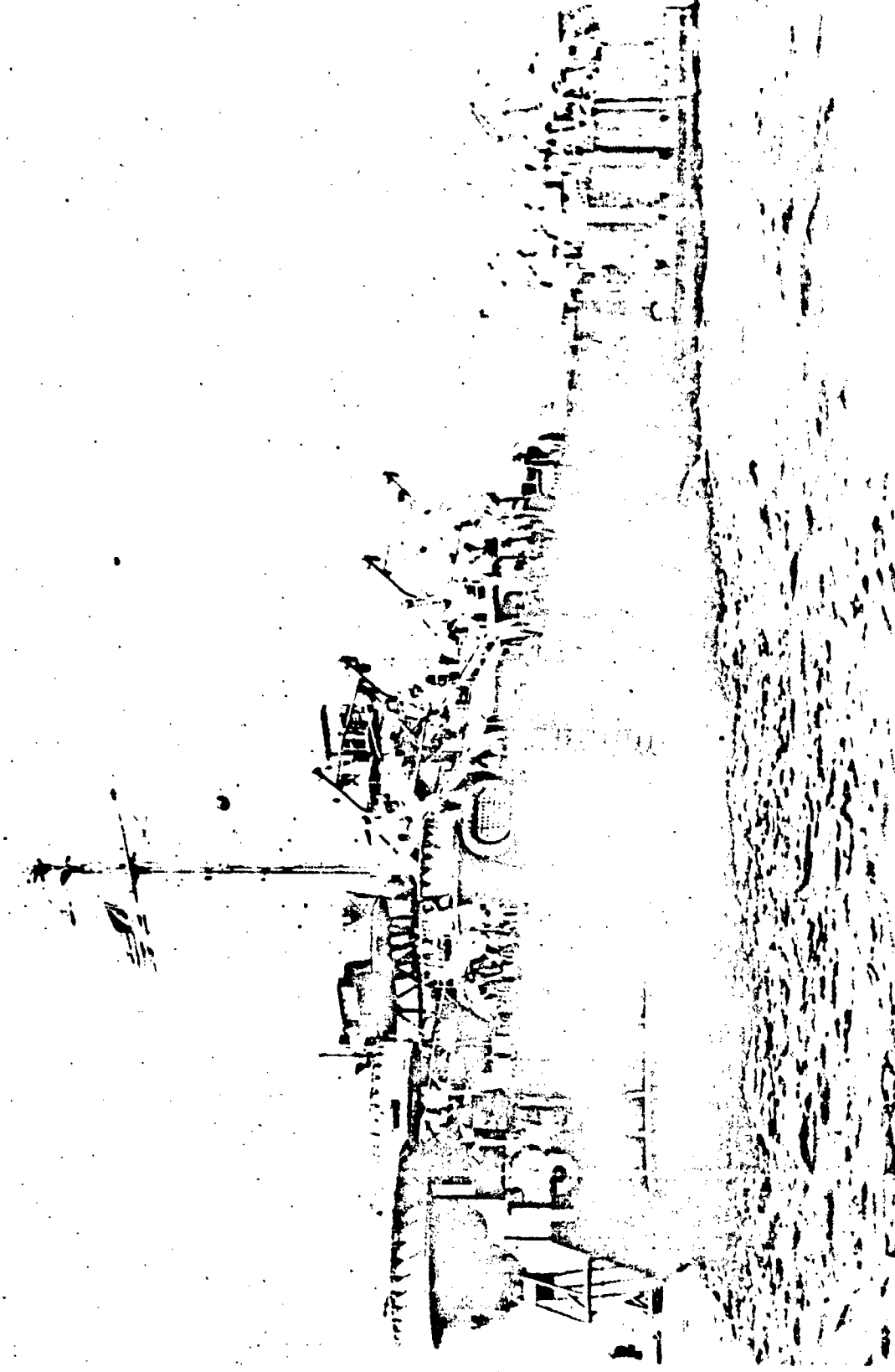
AB-CR-227-289-103. Port quarter after Test B.



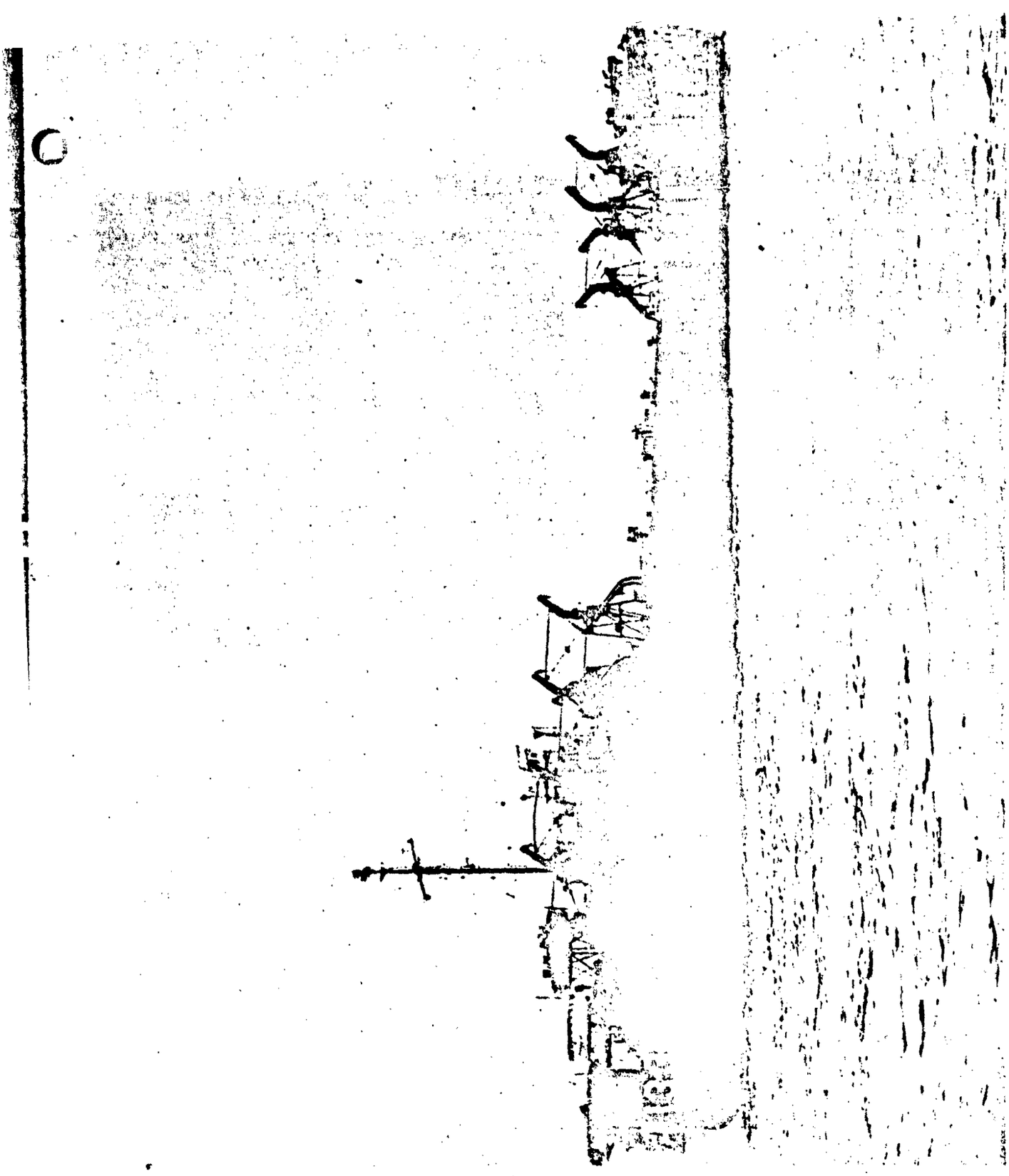
BB-CR-227-519-1. Stern before Test B.



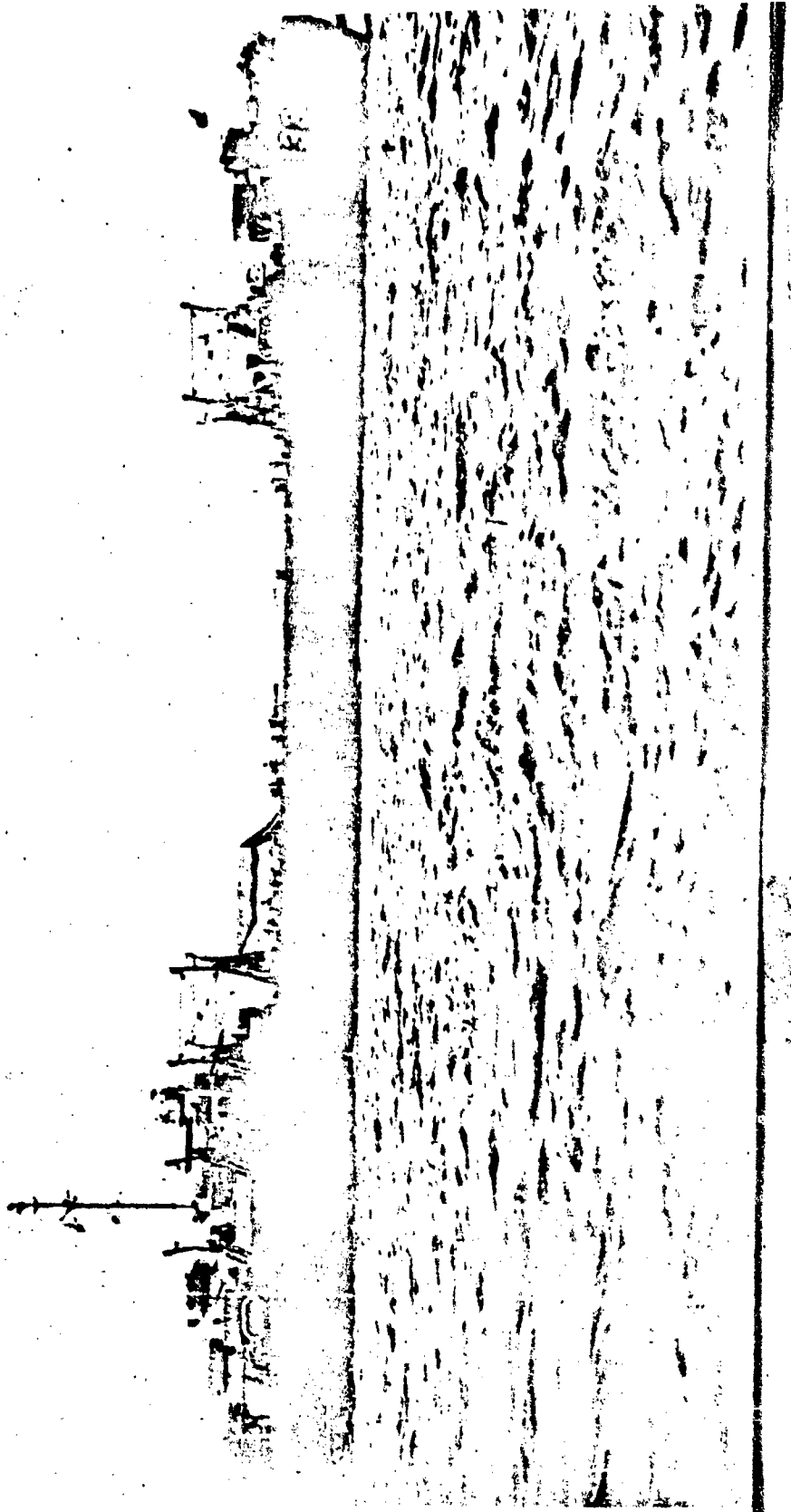
AB-CR-227-289-102. Stern after Test B.



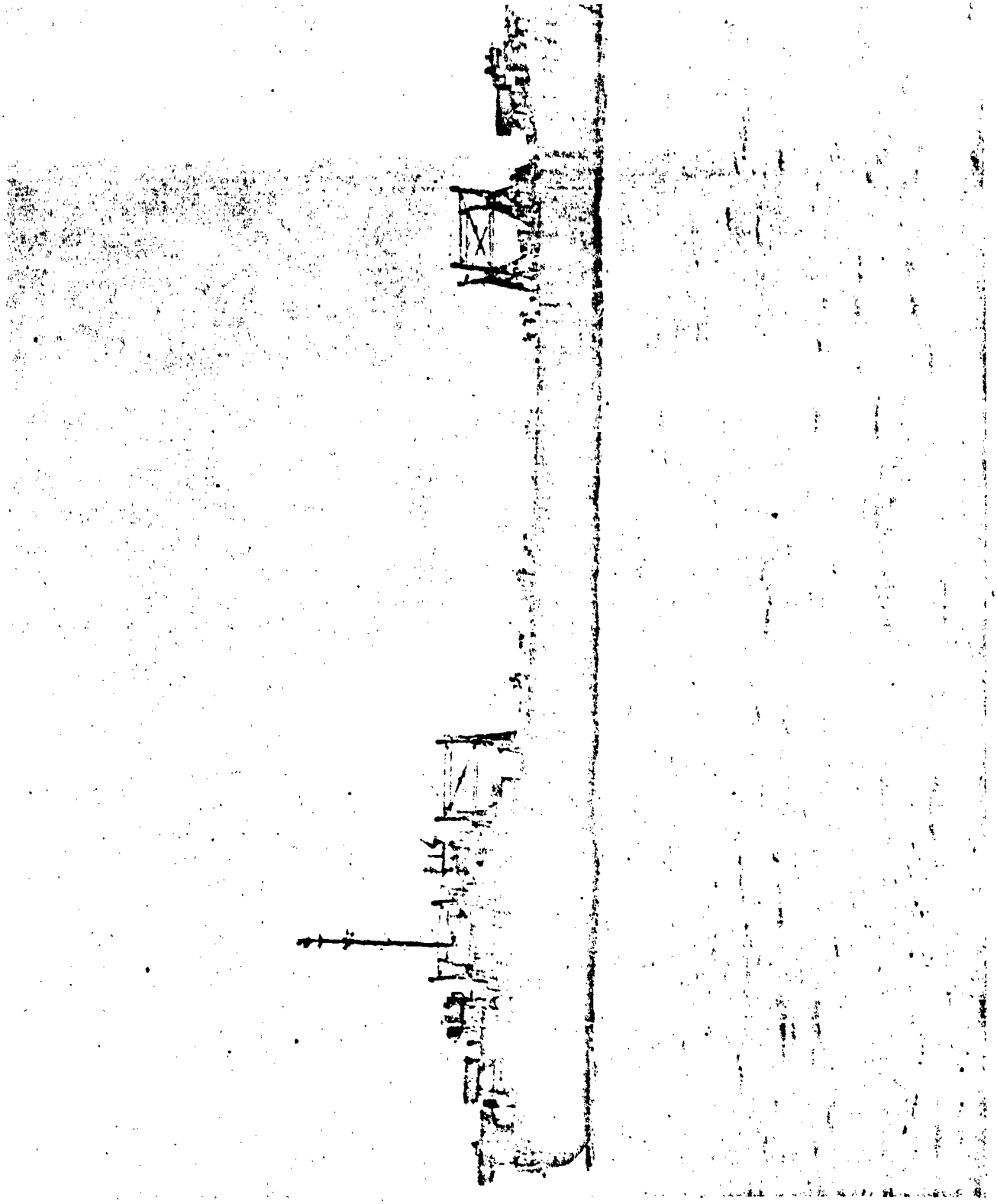
BB-CR-227-519-2. Starboard quarter before Test B.



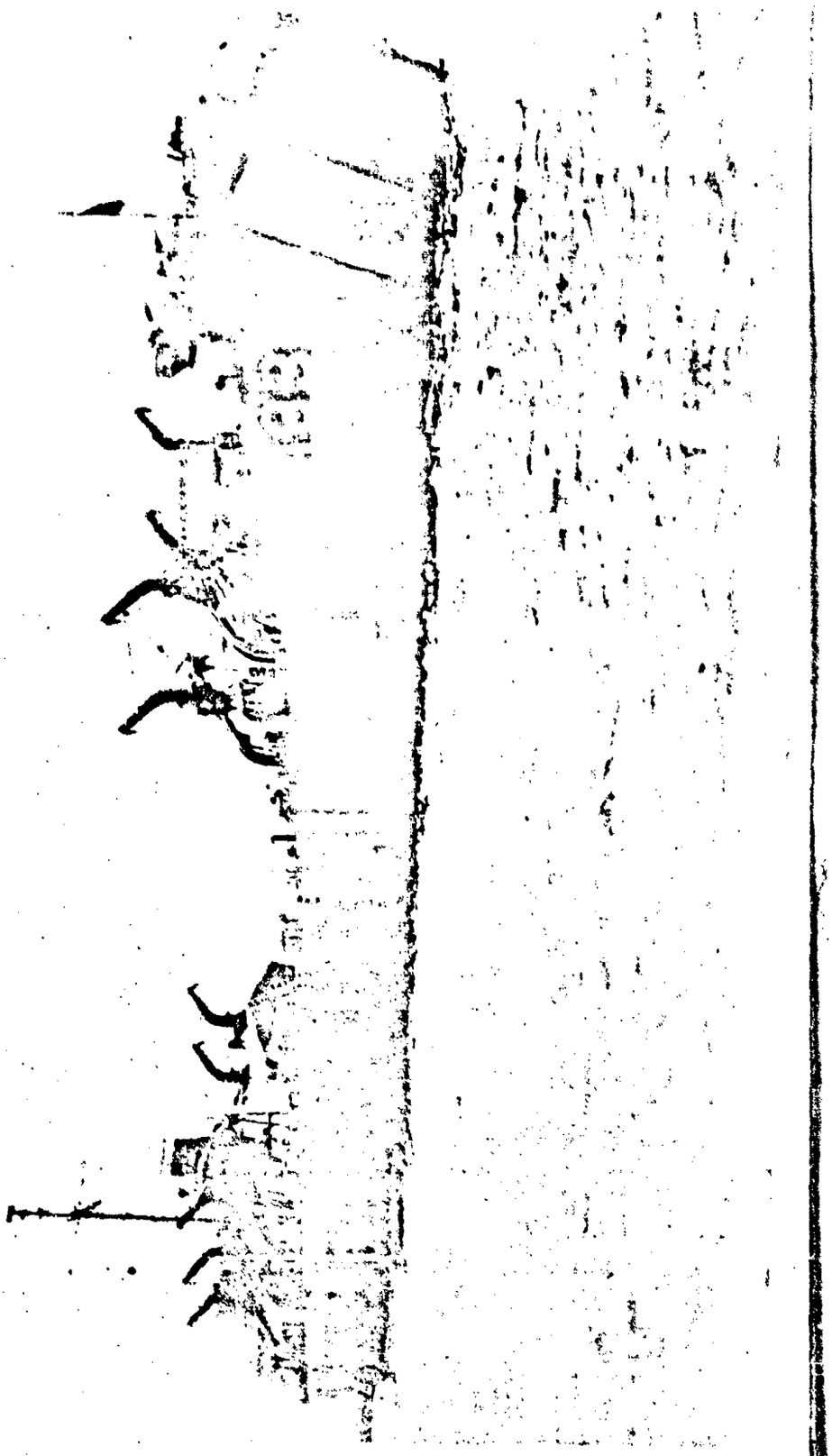
AB-CR-227-289-101. Starboard quarter after Test B.



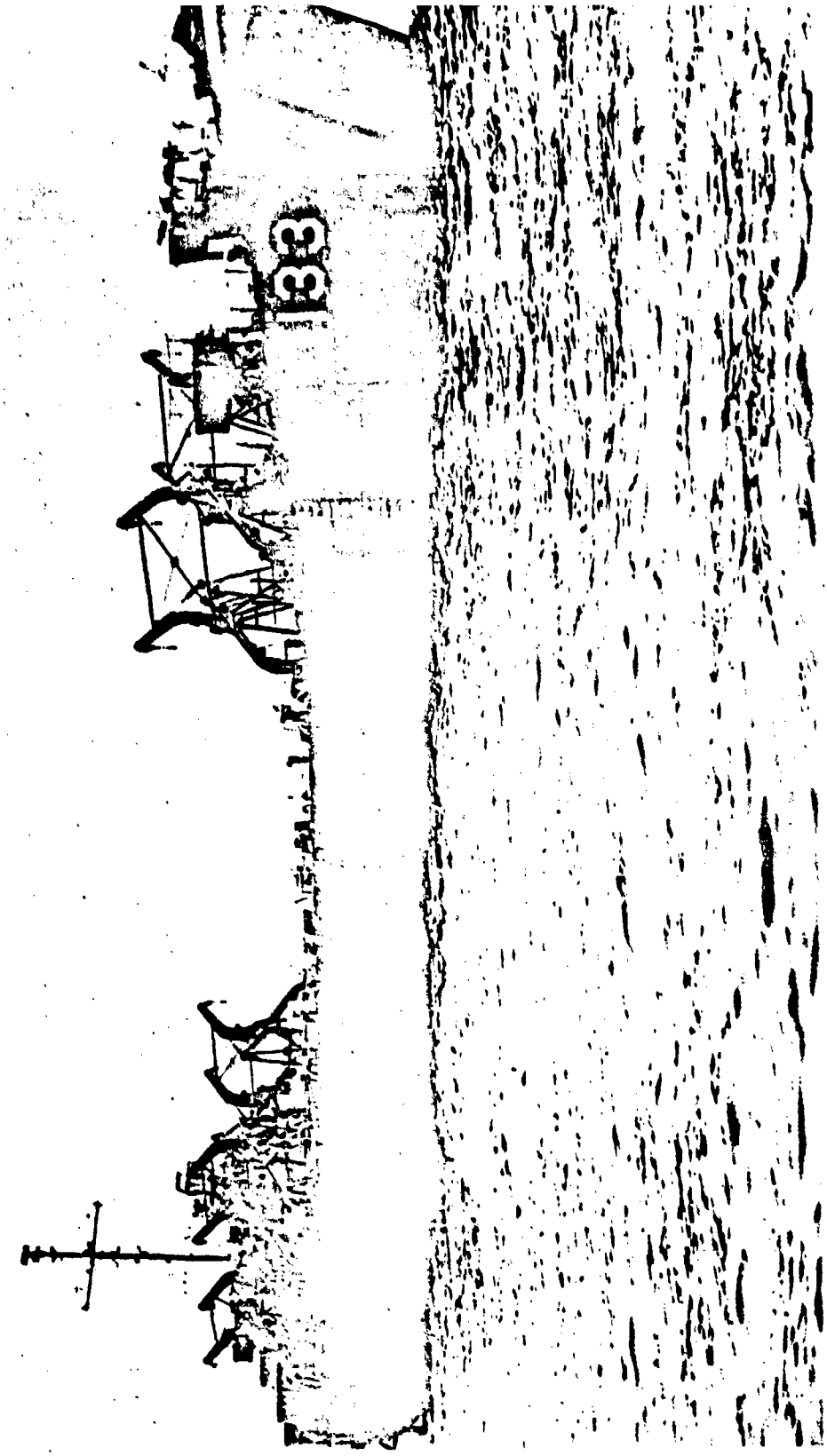
BB-CR-227-519-3. Starboard beam before Test B.



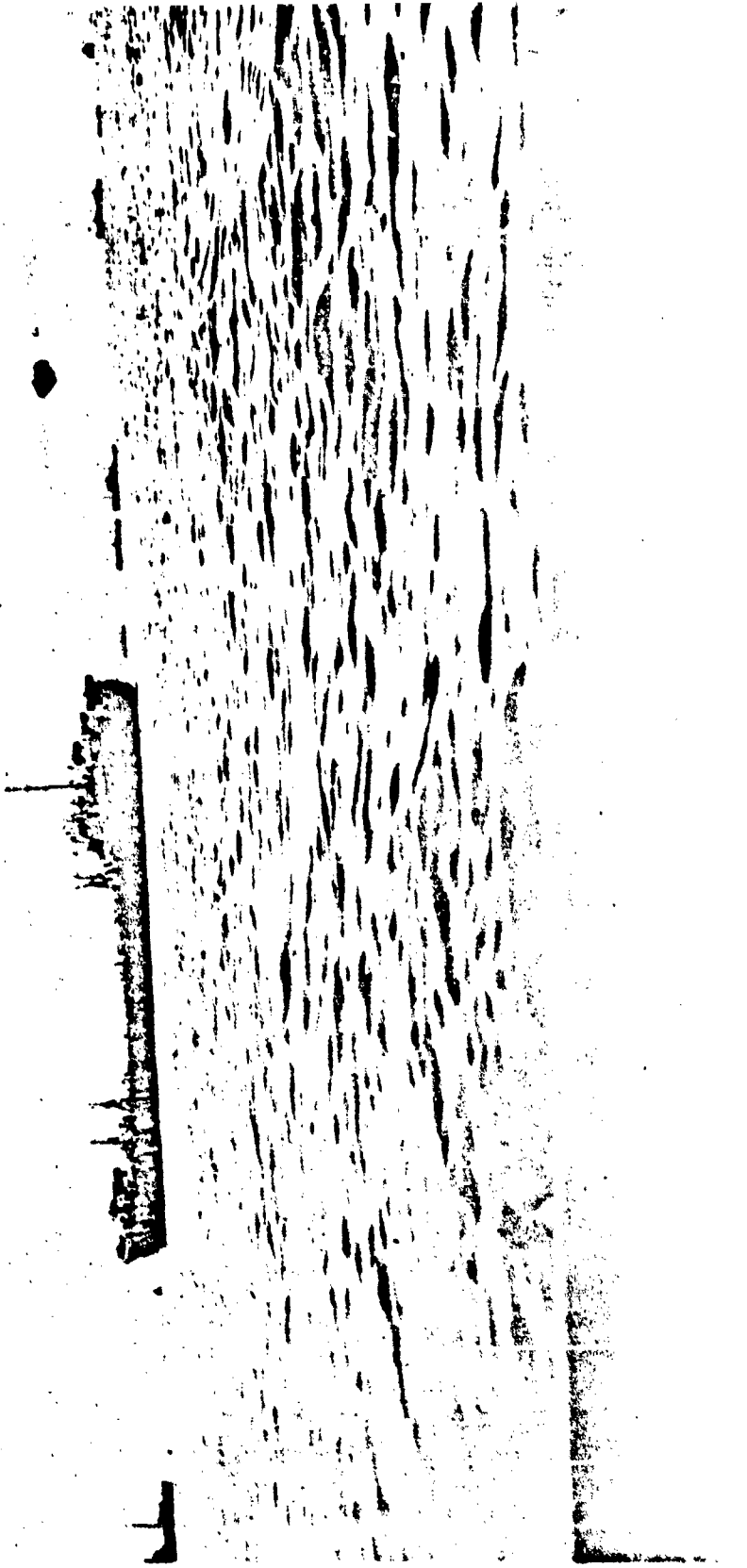
AB-CR-227-289-100. Starboard beam after Test B.



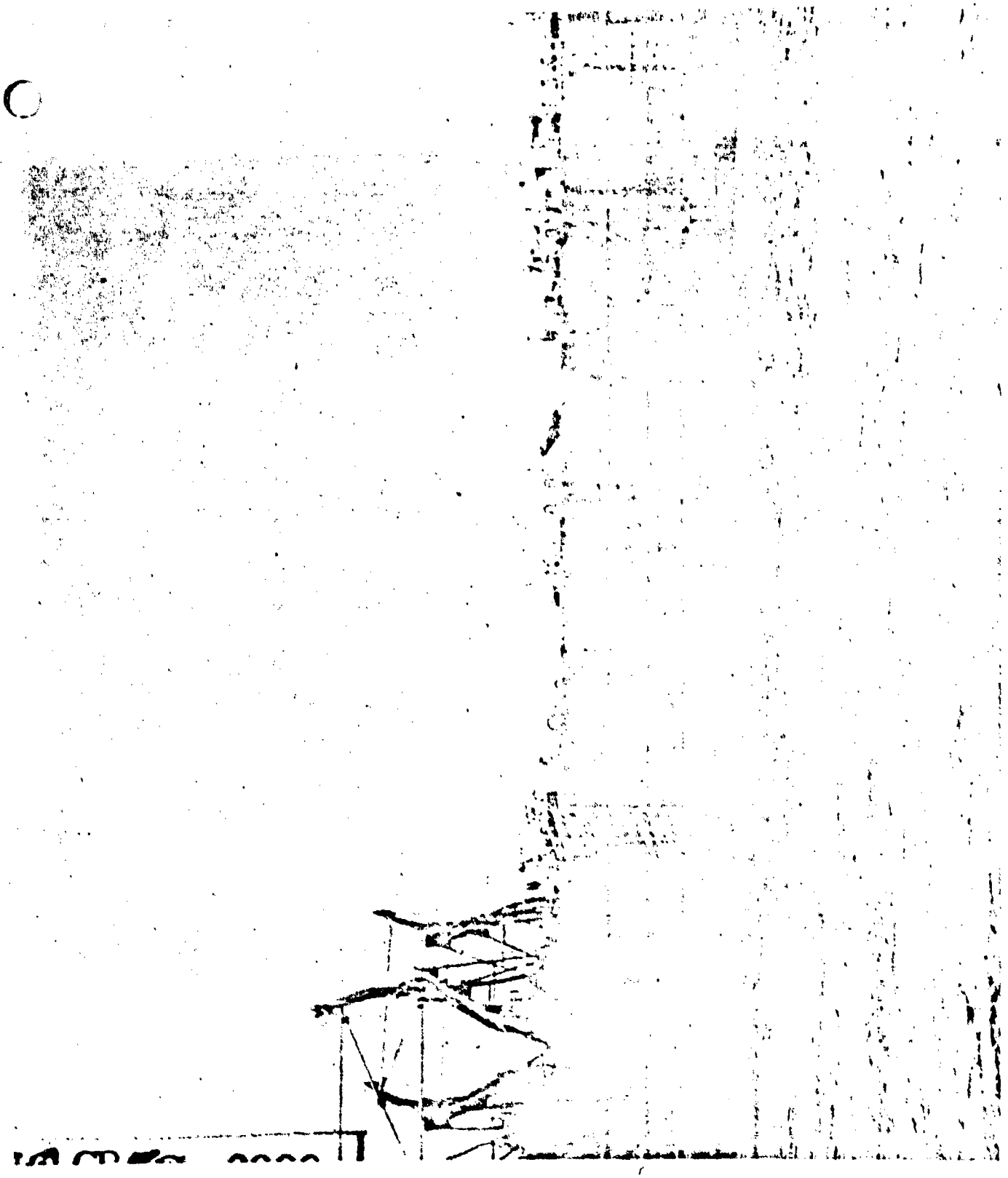
BB-CR-227-519-4. Starboard bow before Test B.



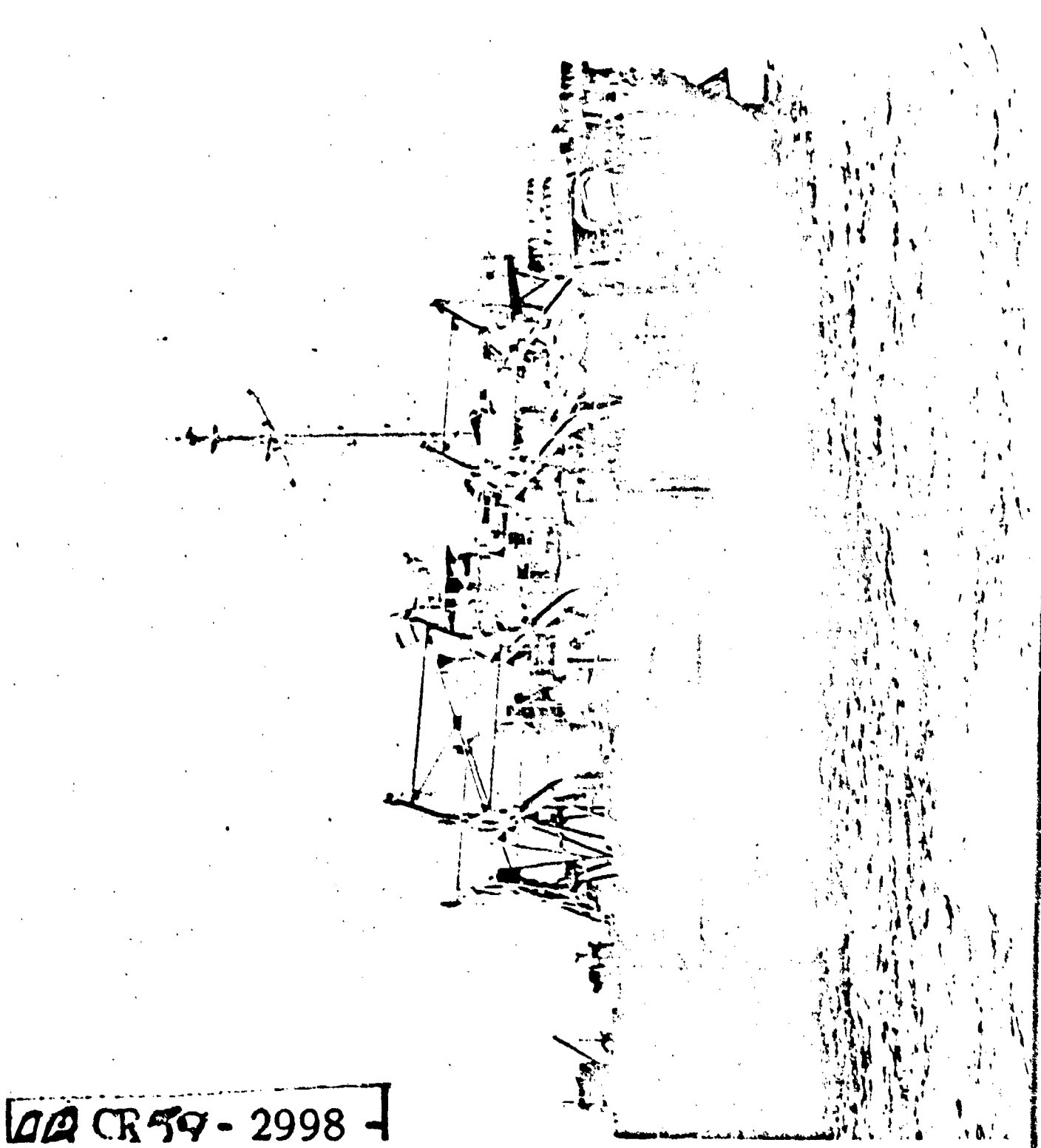
AB-CR-227-289-99. Starboard bow after Test B.



AB-CR-76-2967-6. General view of vessel, port side.

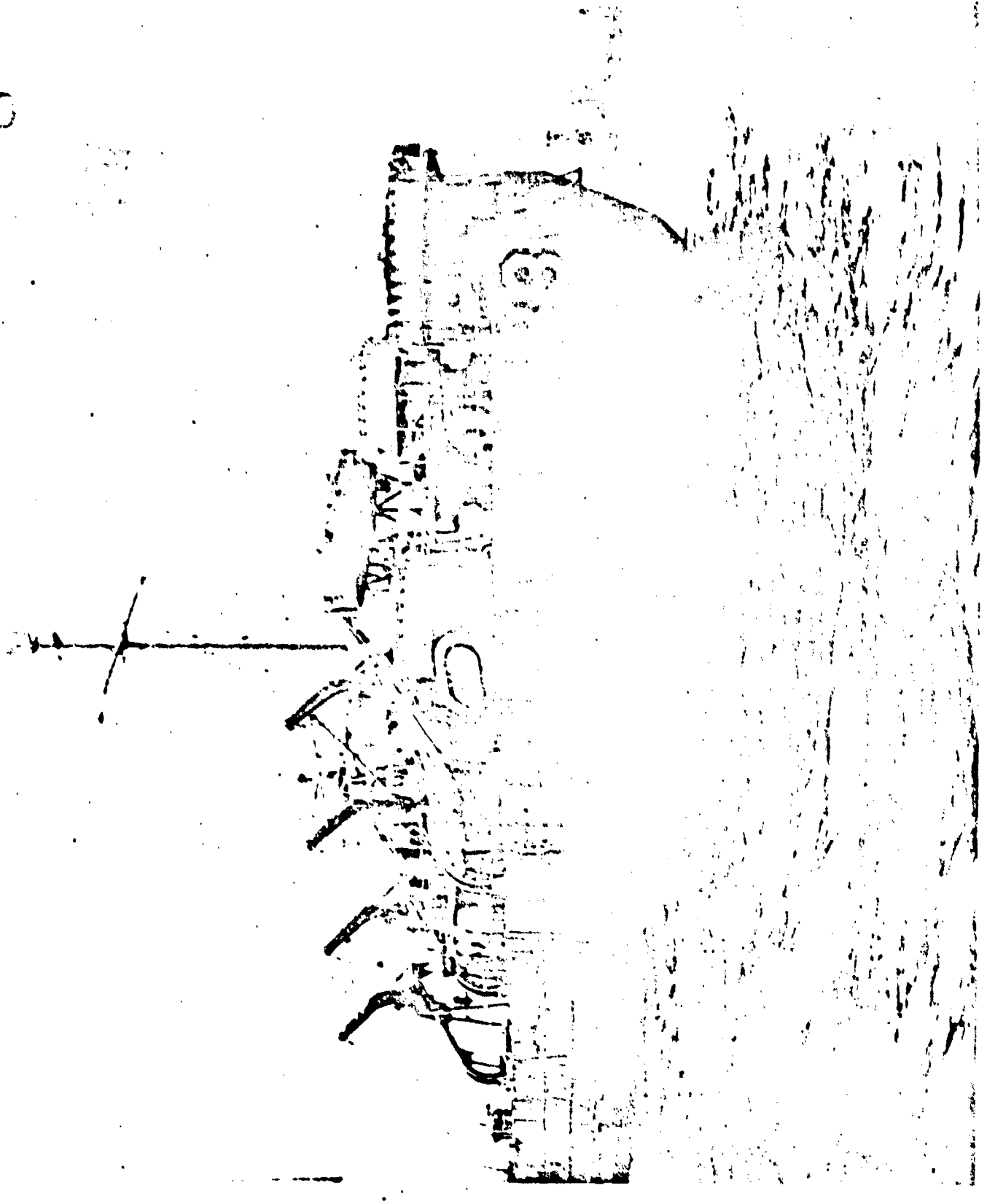


AB-CR-59-2998-2. Exterior view of port side.

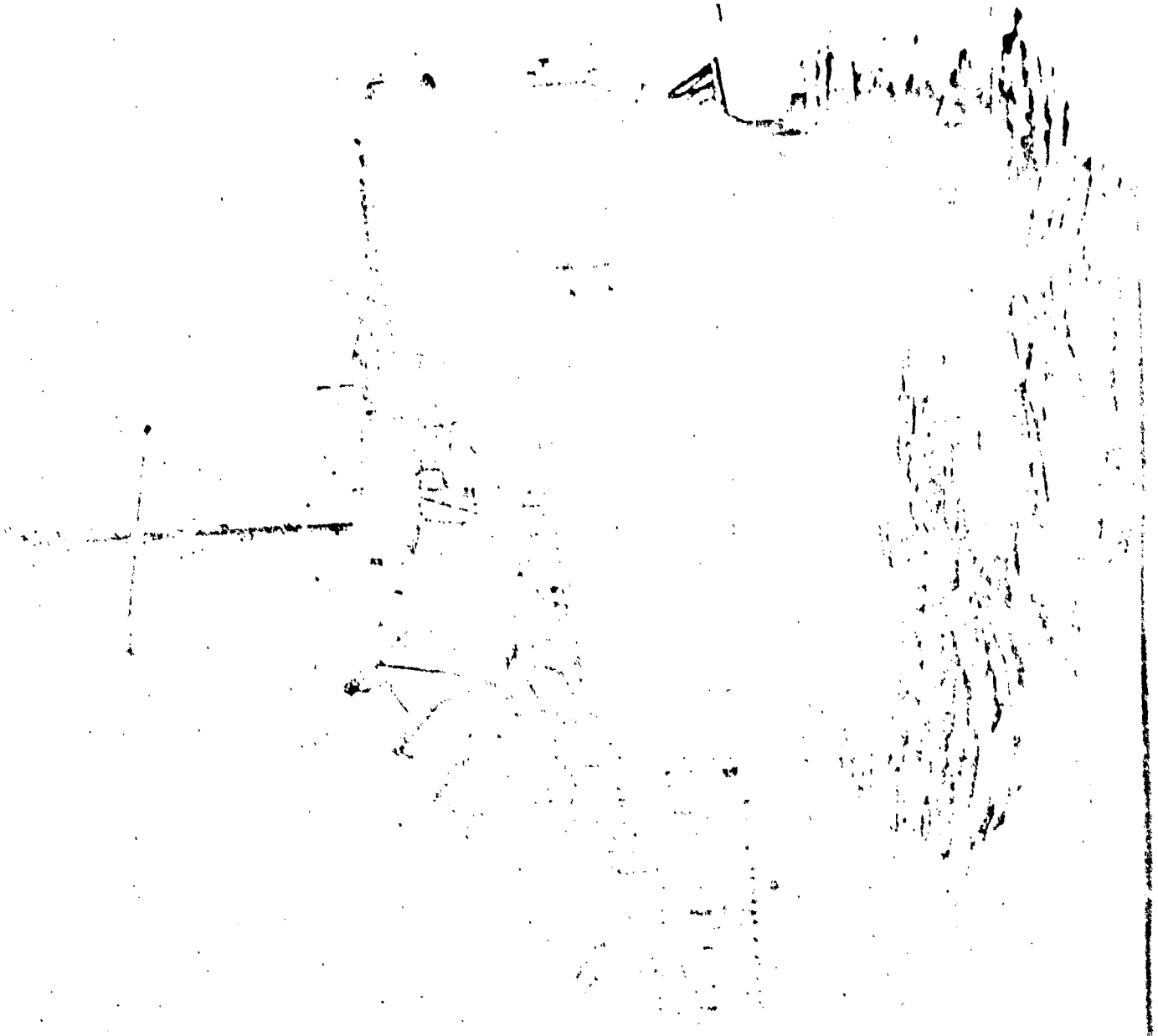


AB CR 59 - 2998

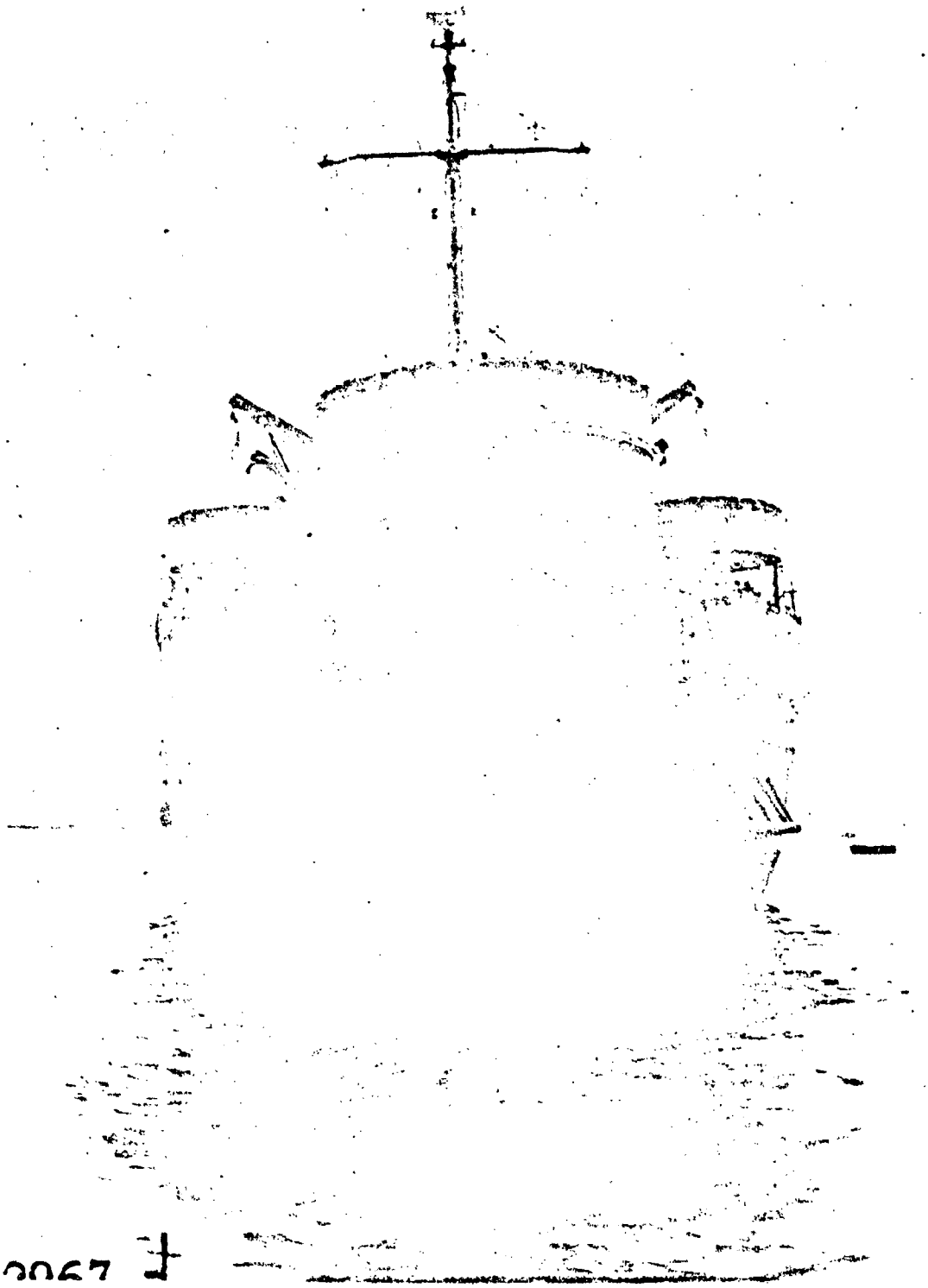
AB-CR-59-2998-3. Exterior view of after portion of vessel, port side.



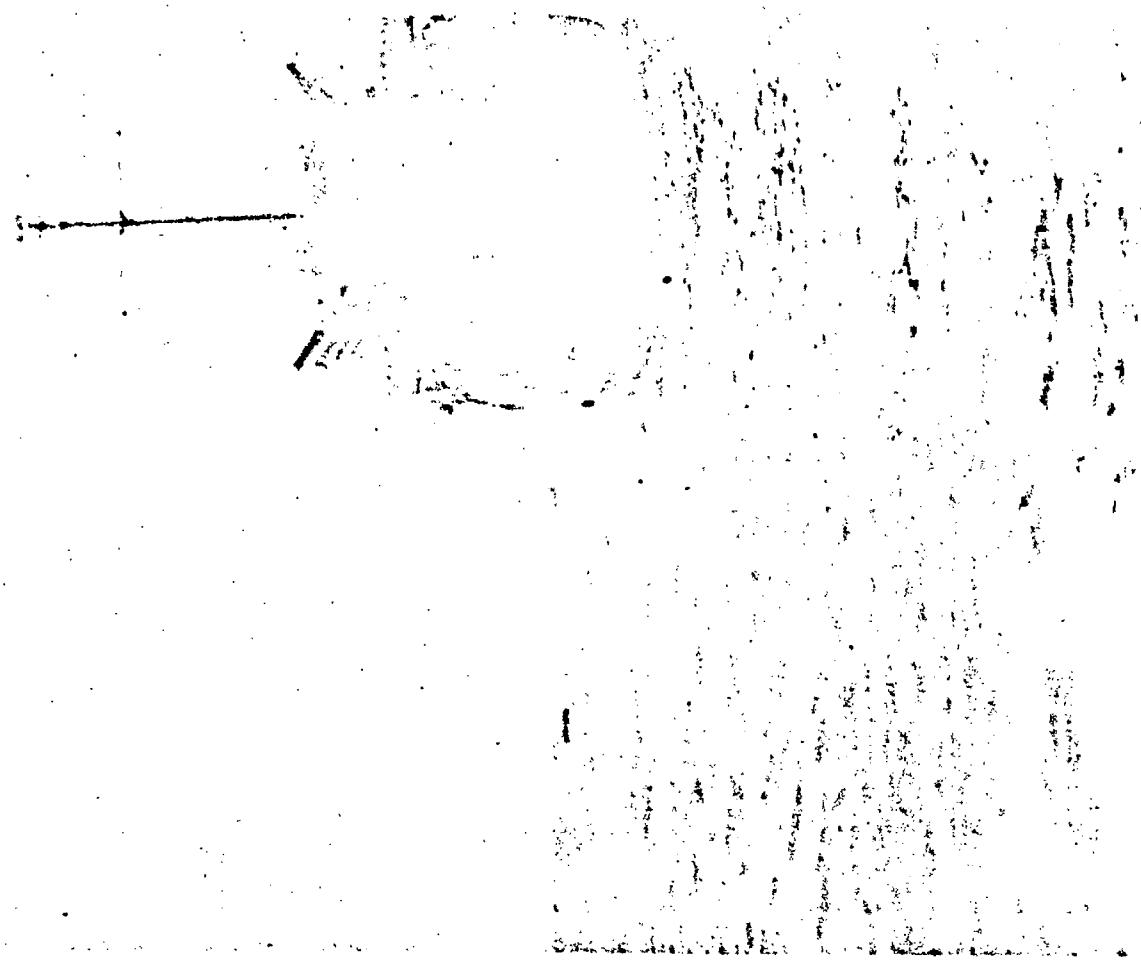
AB-CR-59-2998-4. Exterior view on port quarter. Damage to side plating is pre-test damage.



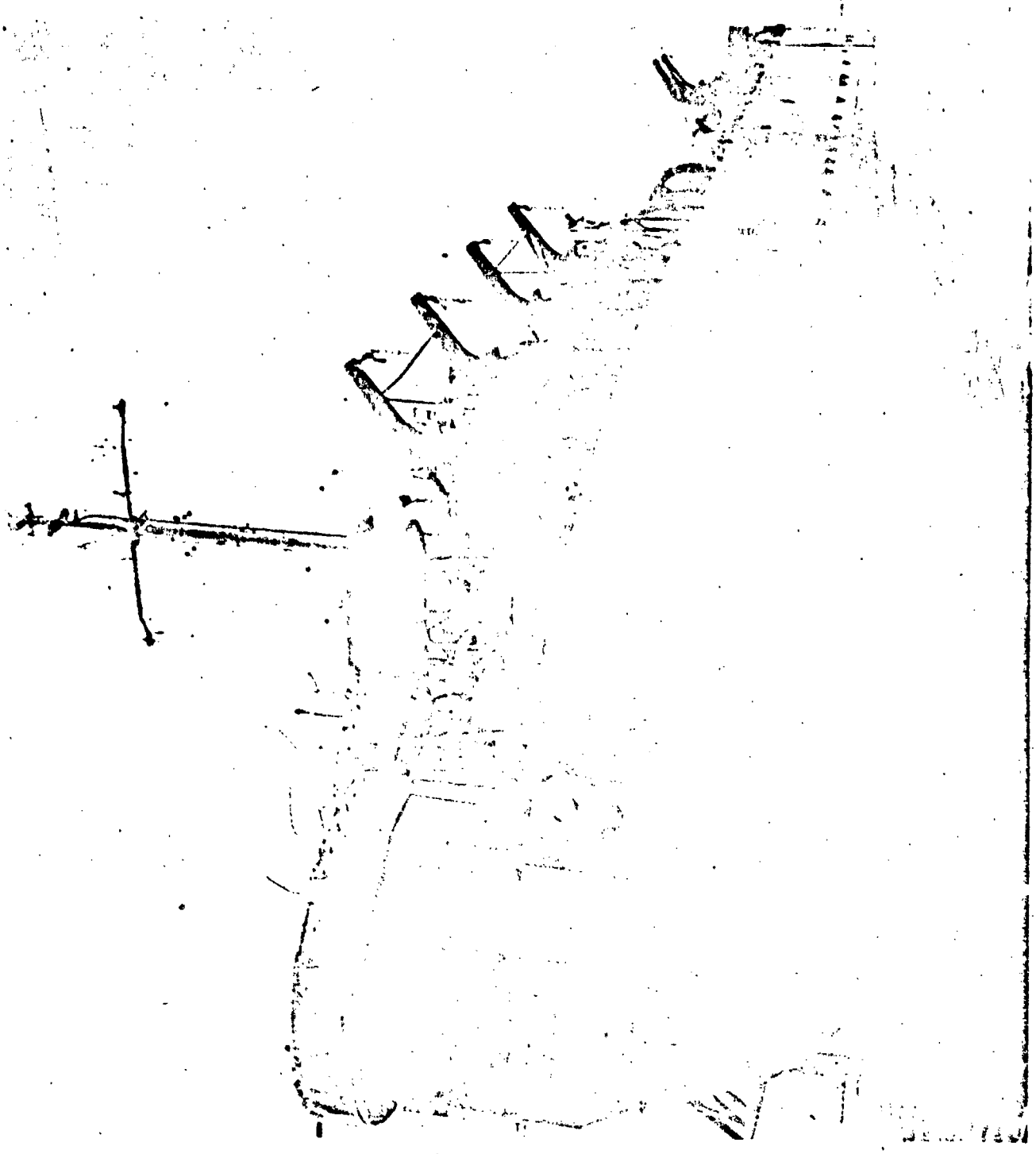
AB-CR-79-2967-7. Exterior view off port quarter. Note outboard rotation of port rudder.



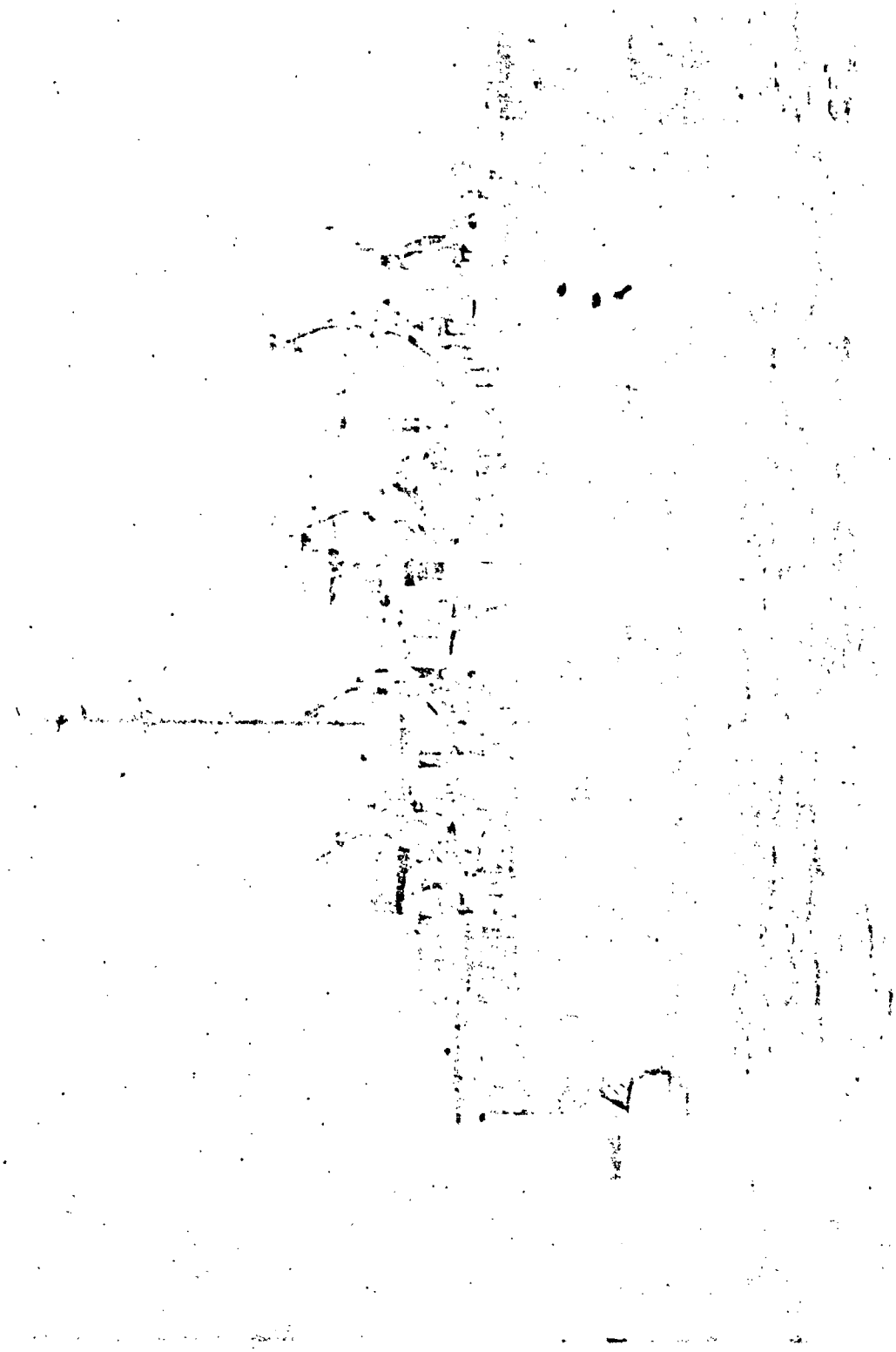
AB-CR-79-2967-8. Close-up of stern, showing port rudder rotated outboard.



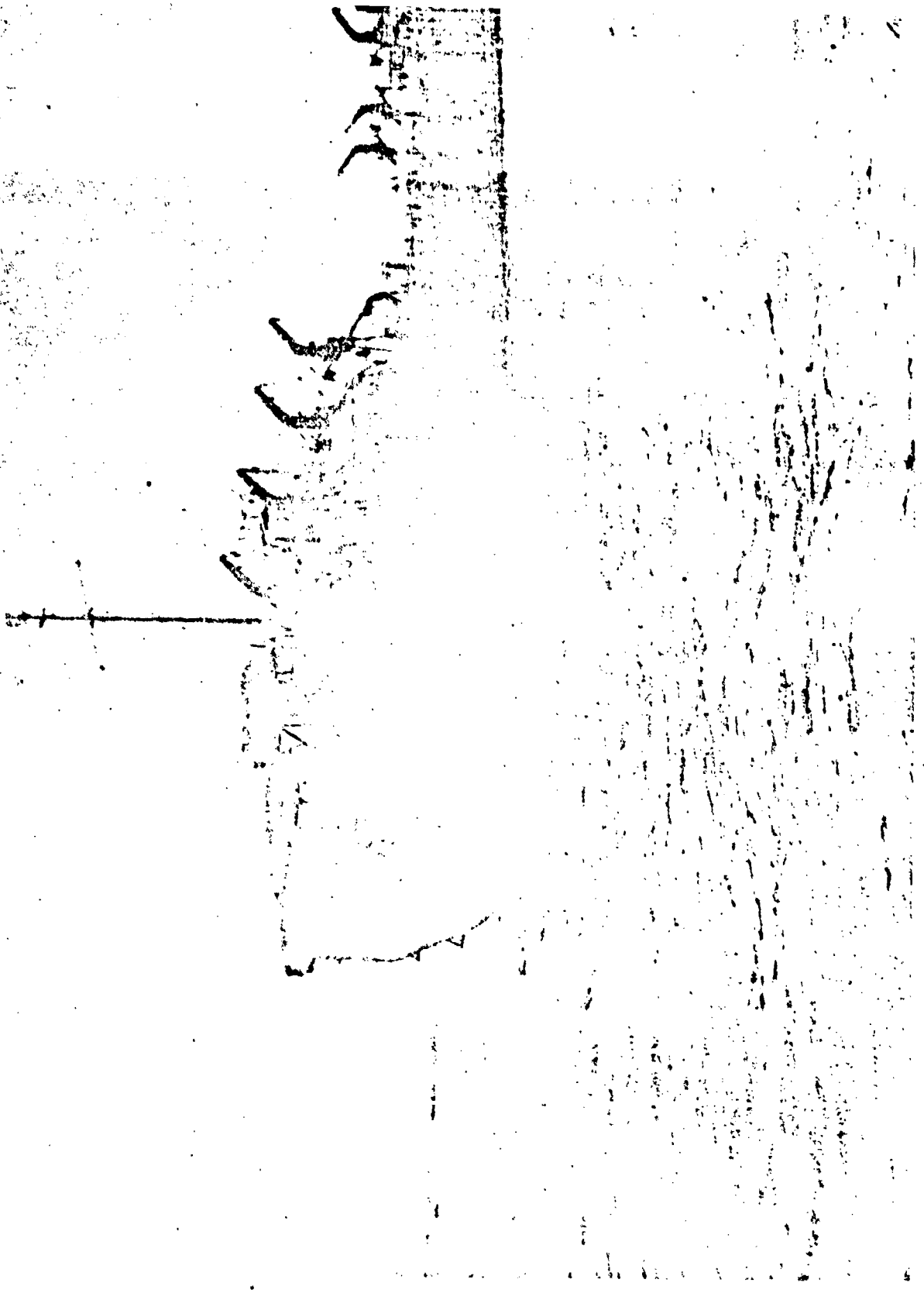
AB-CR-59-2998-5. Exterior view, dead astern.



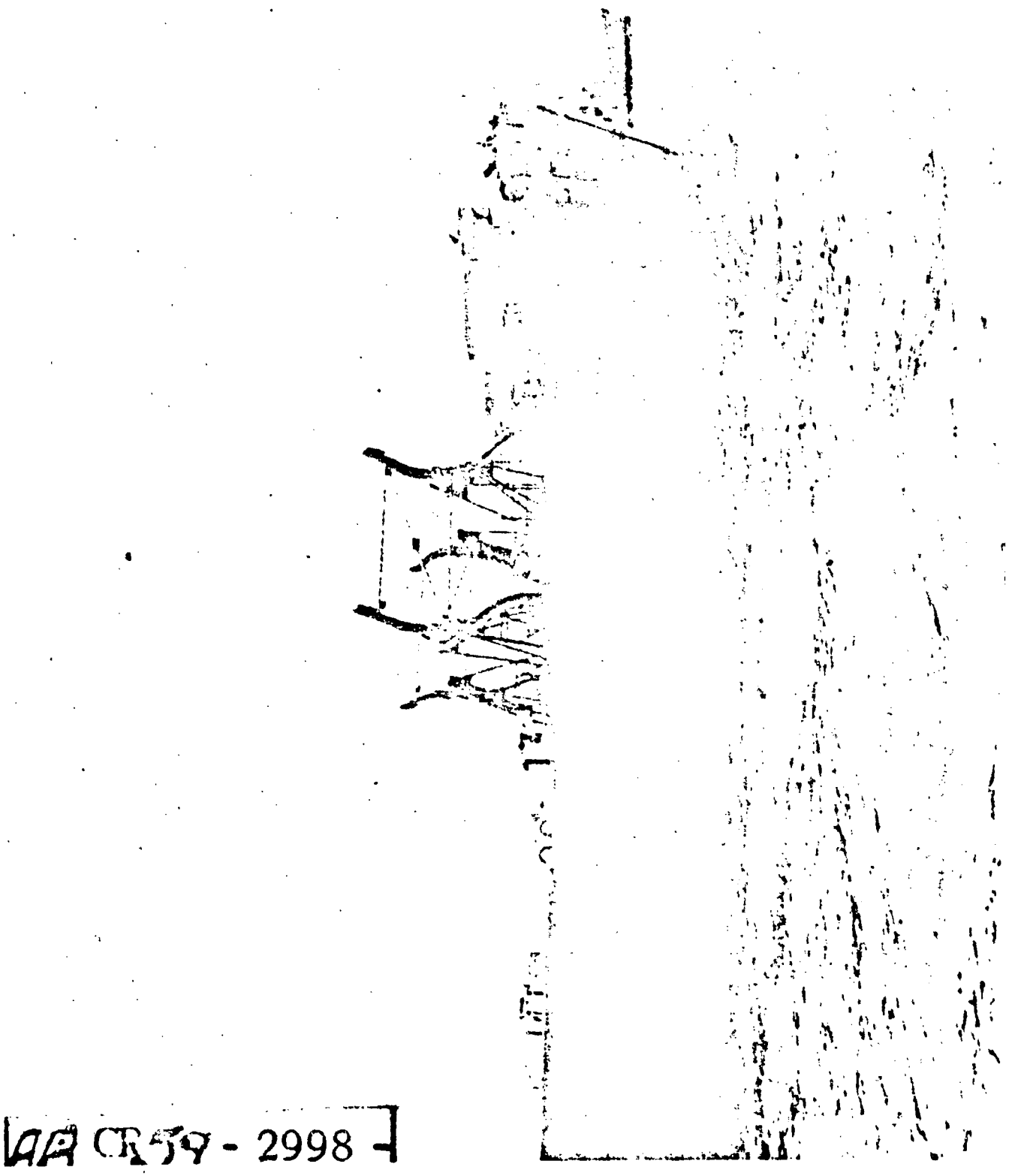
AB-CR-79-2967-9. Close-up of starboard quarter. Starboard rudder is fore and aft but port rudder has been forced against outboard limit stop.



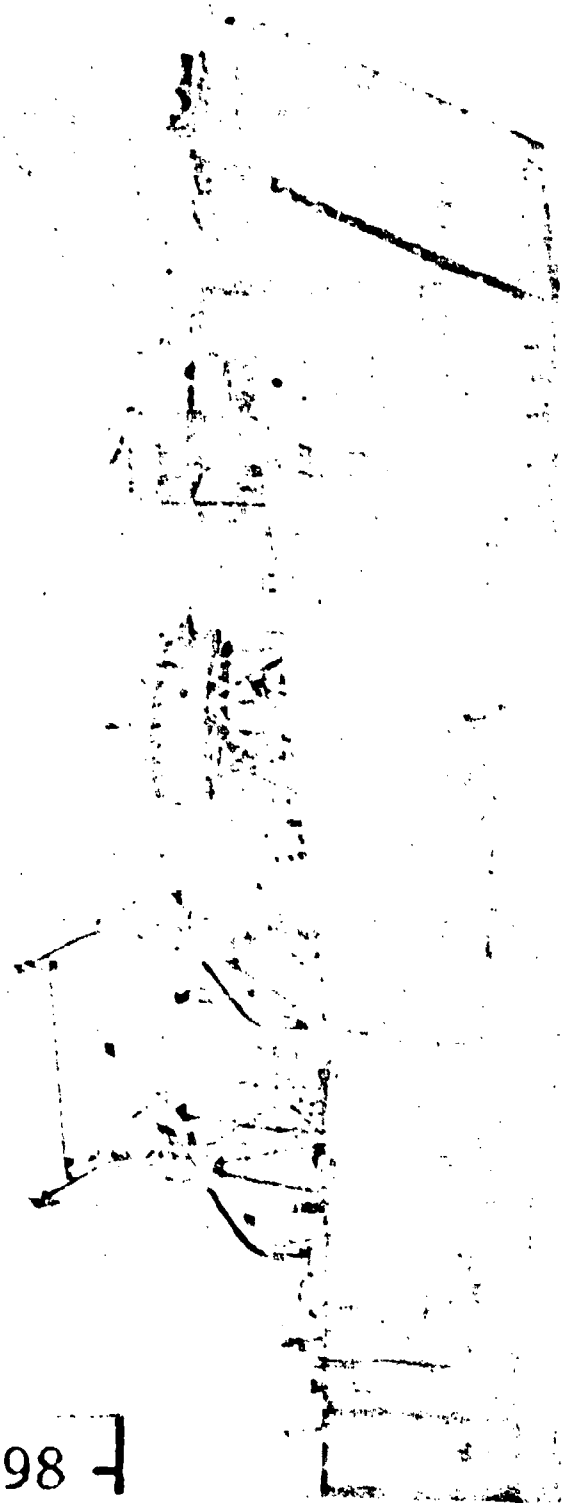
AB-CR-59-2998-7. Exterior view of after portion of vessel, starboard side.



AB-CR-59-2998-C. Exterior view of vessel from starboard quarter. Note trim by bow. Bent in strongback of No. 5 davit is pre-test damage.



AB-CR-59-2998-8. Exterior view of forward portion of vessel, starboard side.



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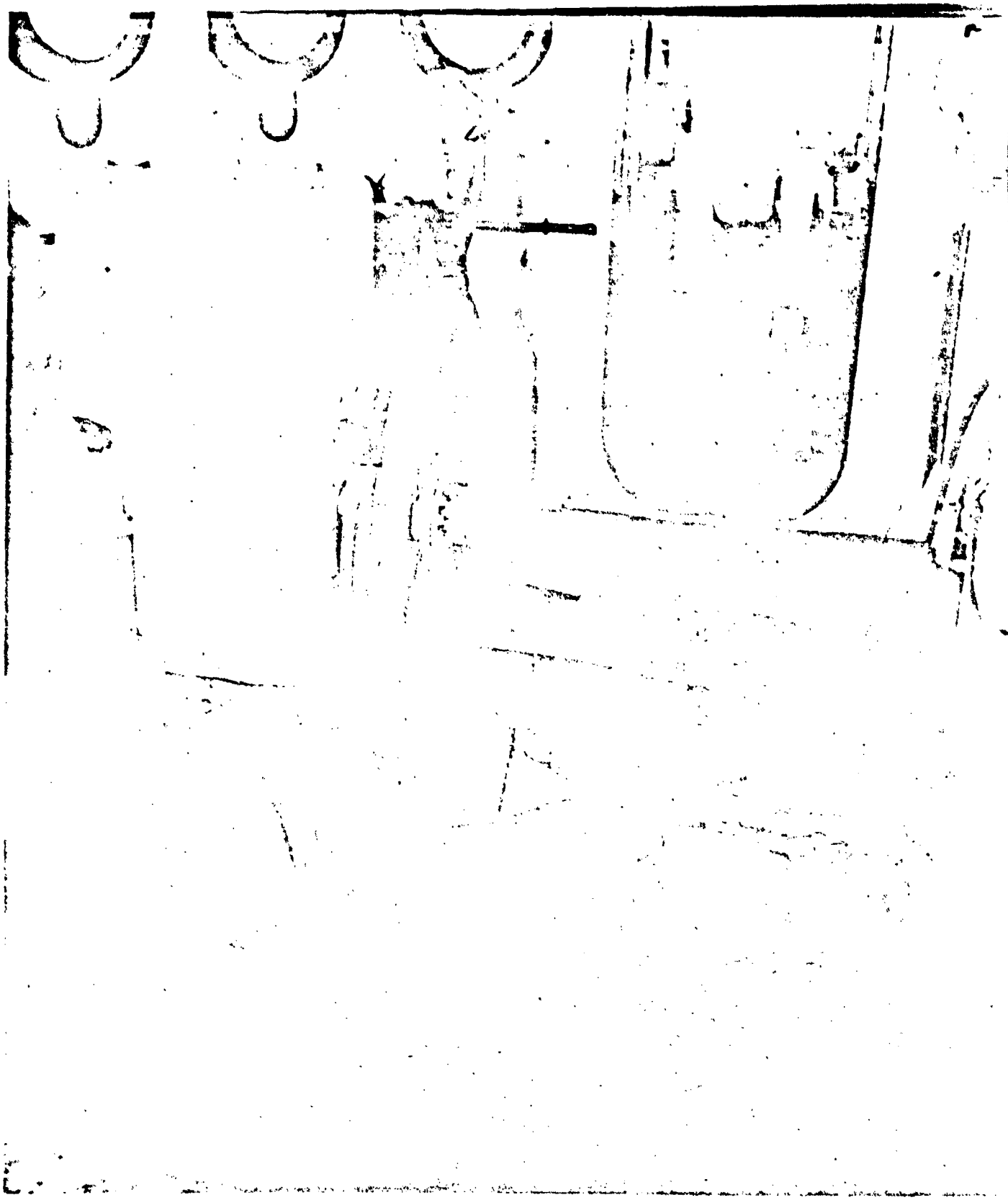
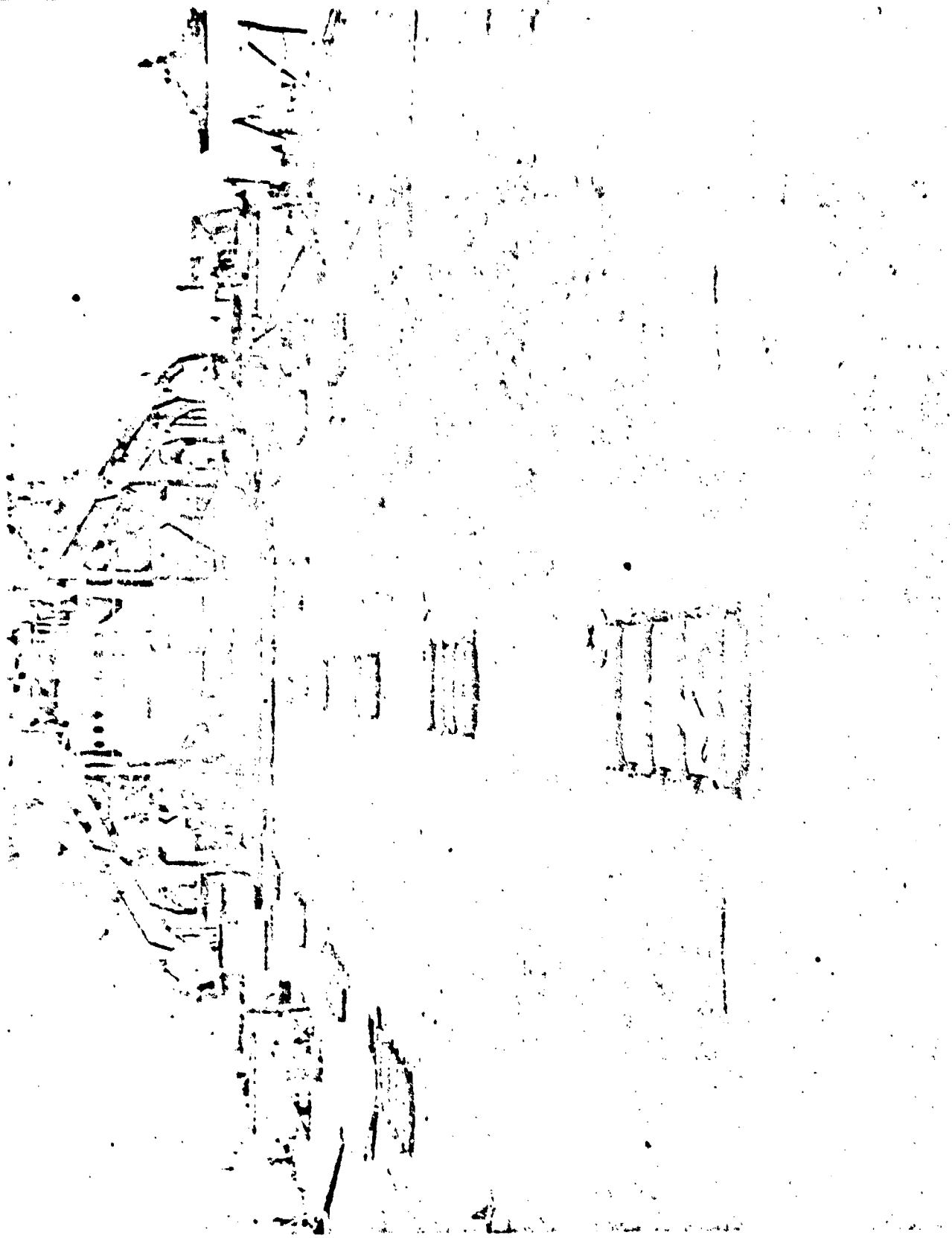
AB-CR-59-2998-9. Exterior view on starboard bow.

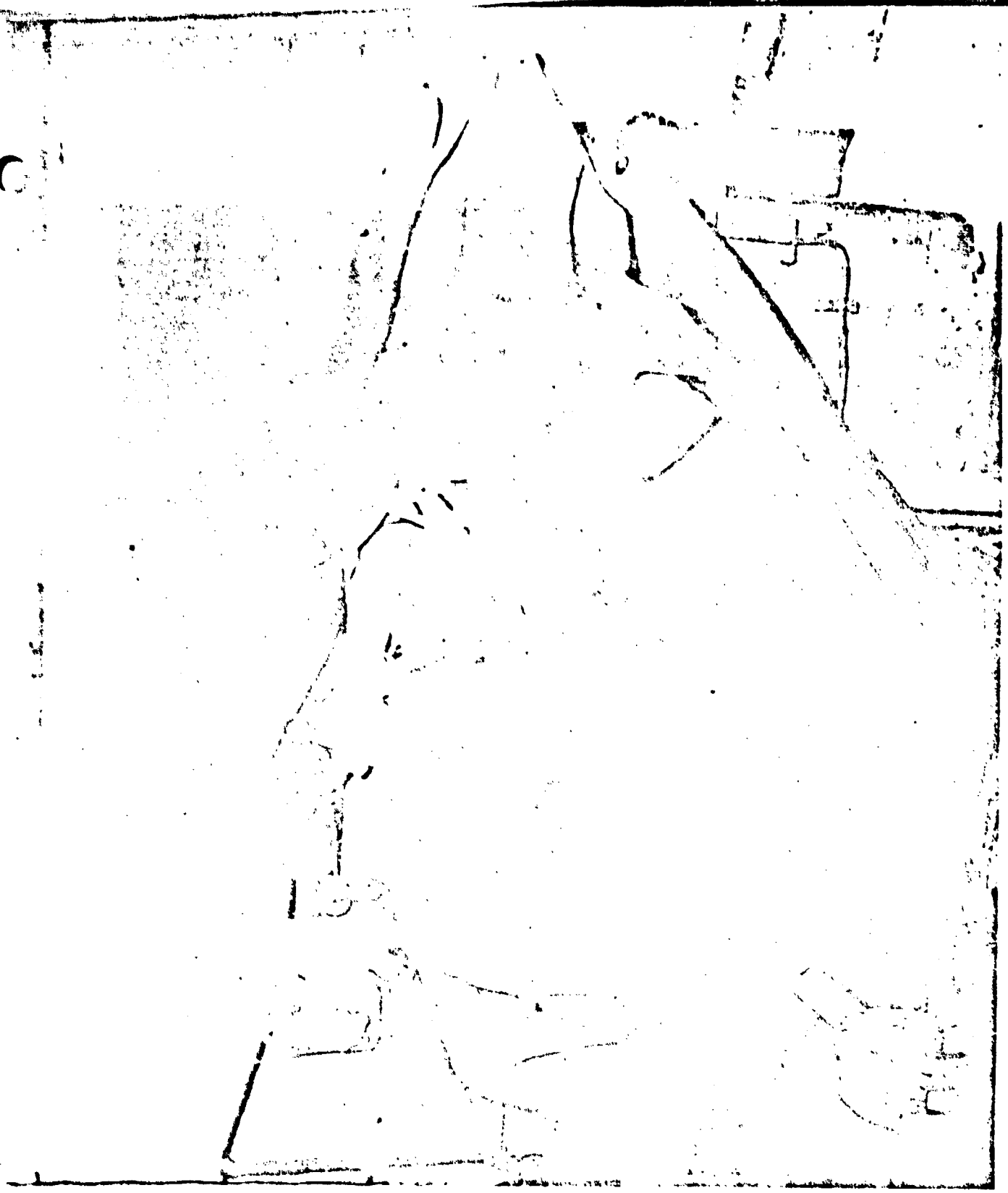


AB-CR-82-4220-6. Navigation bridge showing condition of equipment in wheel-house.

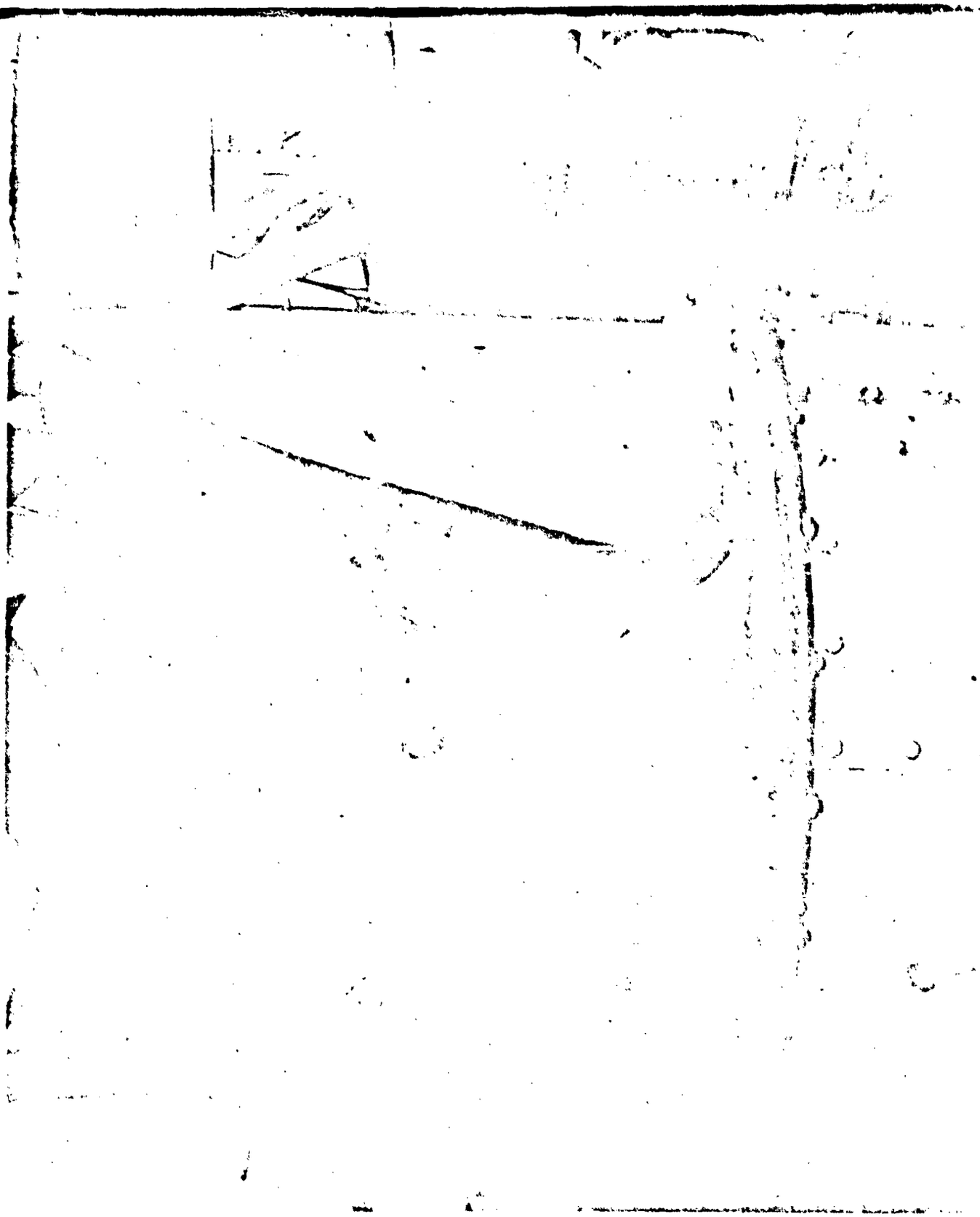
AB-CR-82-4220-5. Main deck, frame 36 1/4, starboard joiner bulkhead damage.



AB-CR-82-4218-9. Main deck, looking aft, showing panel deflection of deck.

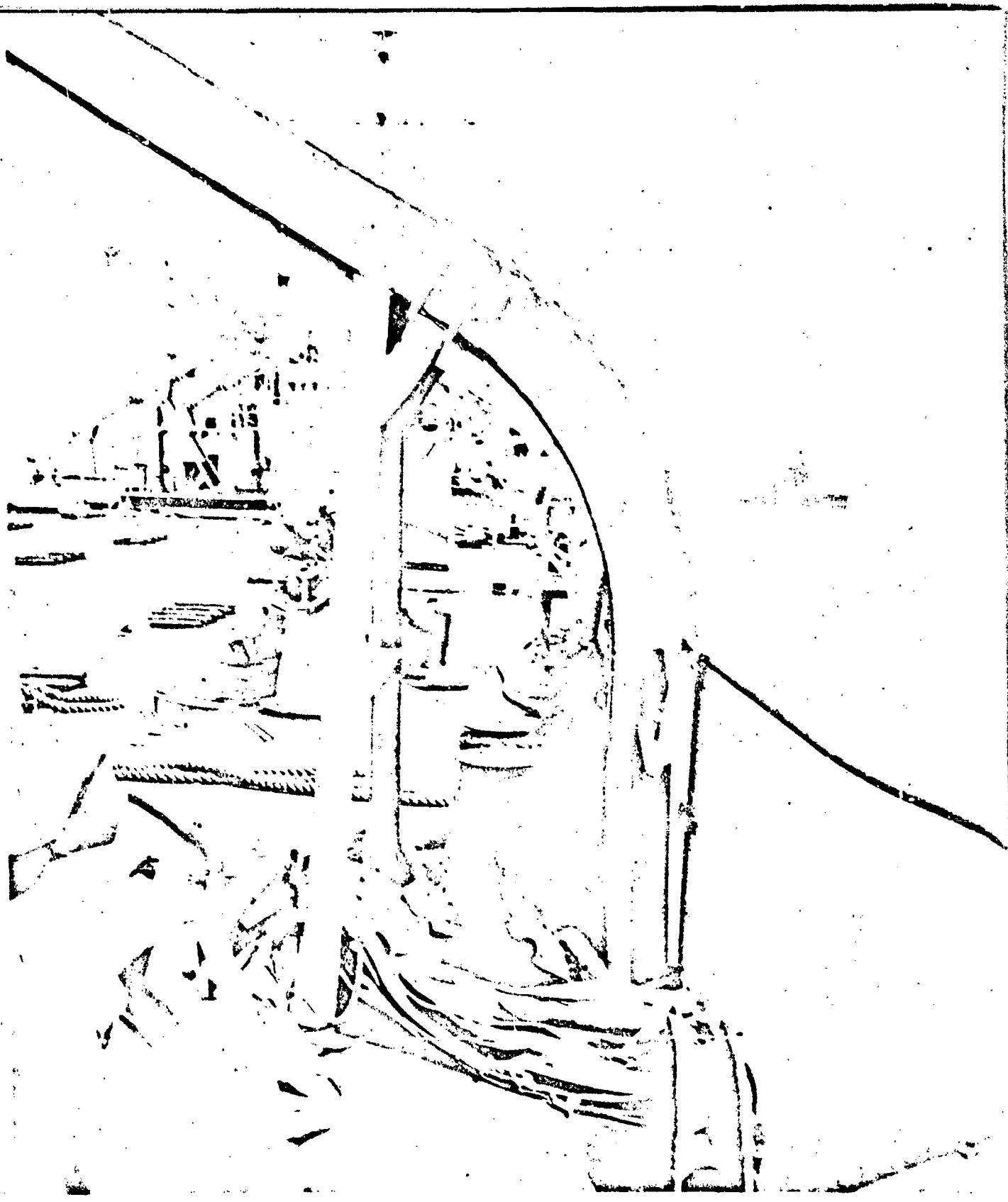


AB-CR-82-4218-11. Main deck. Fragment of LSM-60 lodged in forward starboard winch.

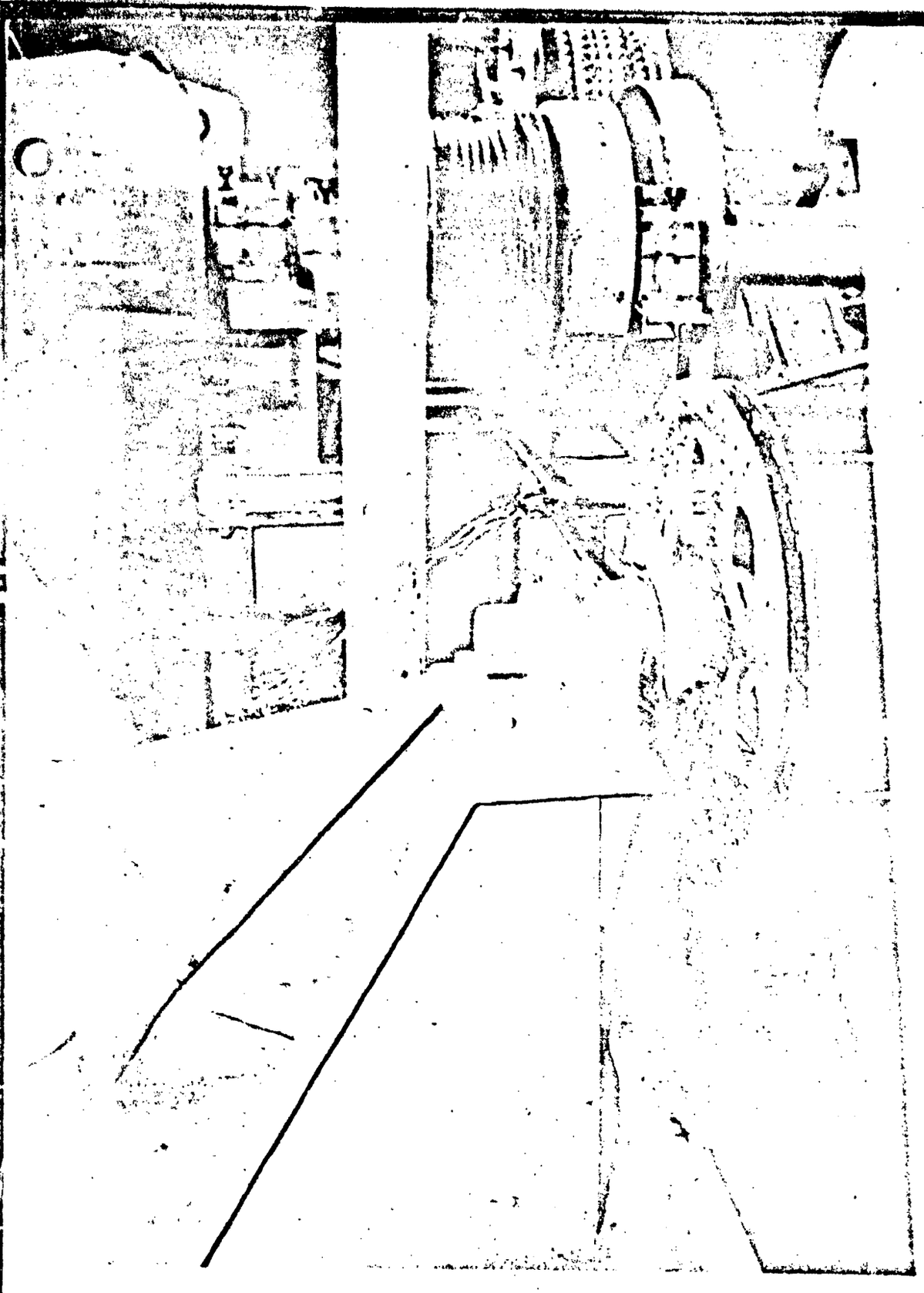


B-CR-82-4218-10. Main deck. Ventilation trunk at frame 14, showing typical failure to topside light structures.

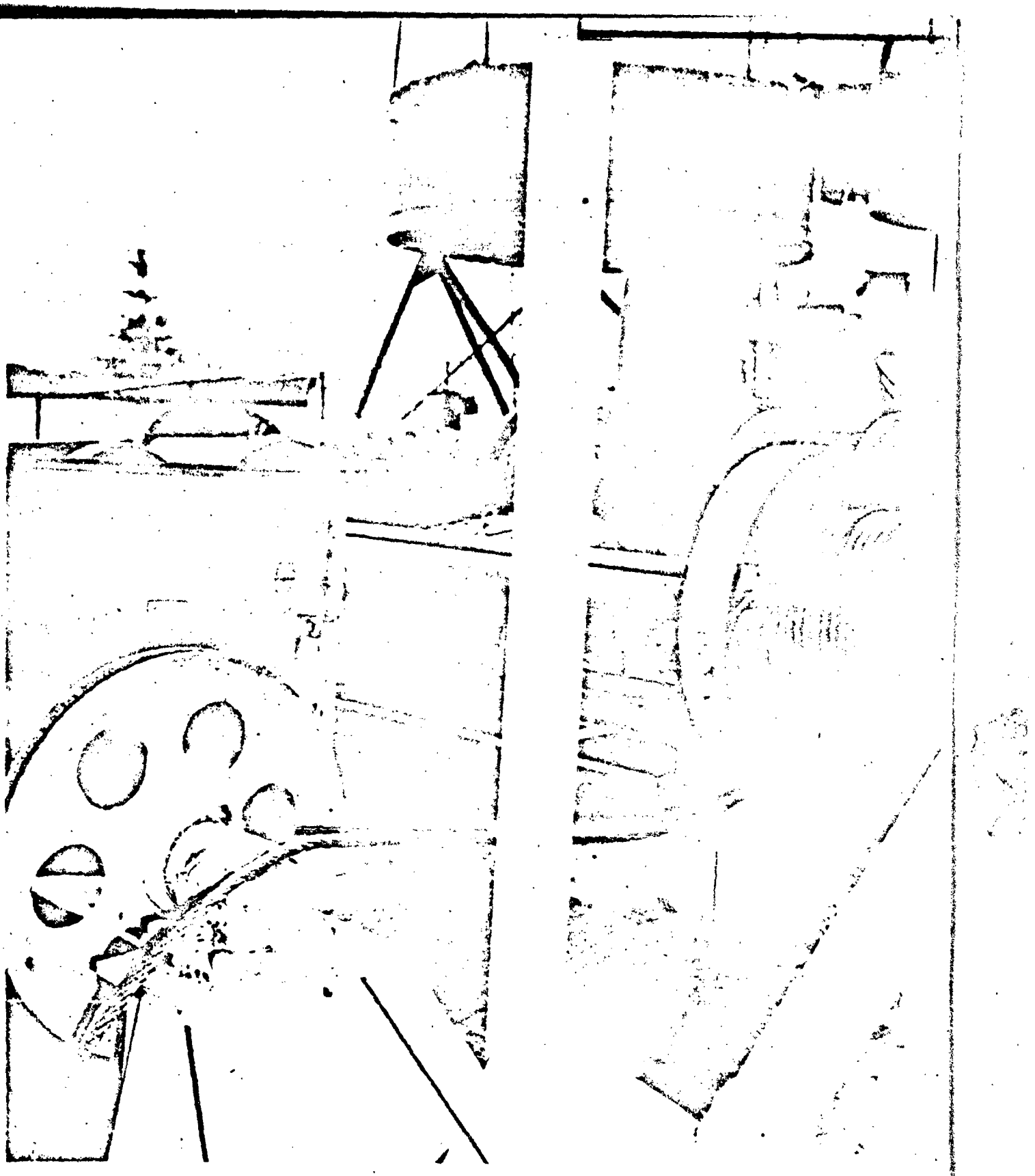
AB-CR-82-4219-5. Main deck, displaced strongbacks on after hatch. One I beam was found aft on first level of superstructure. Note damaged sun shield on ready service box in foreground.



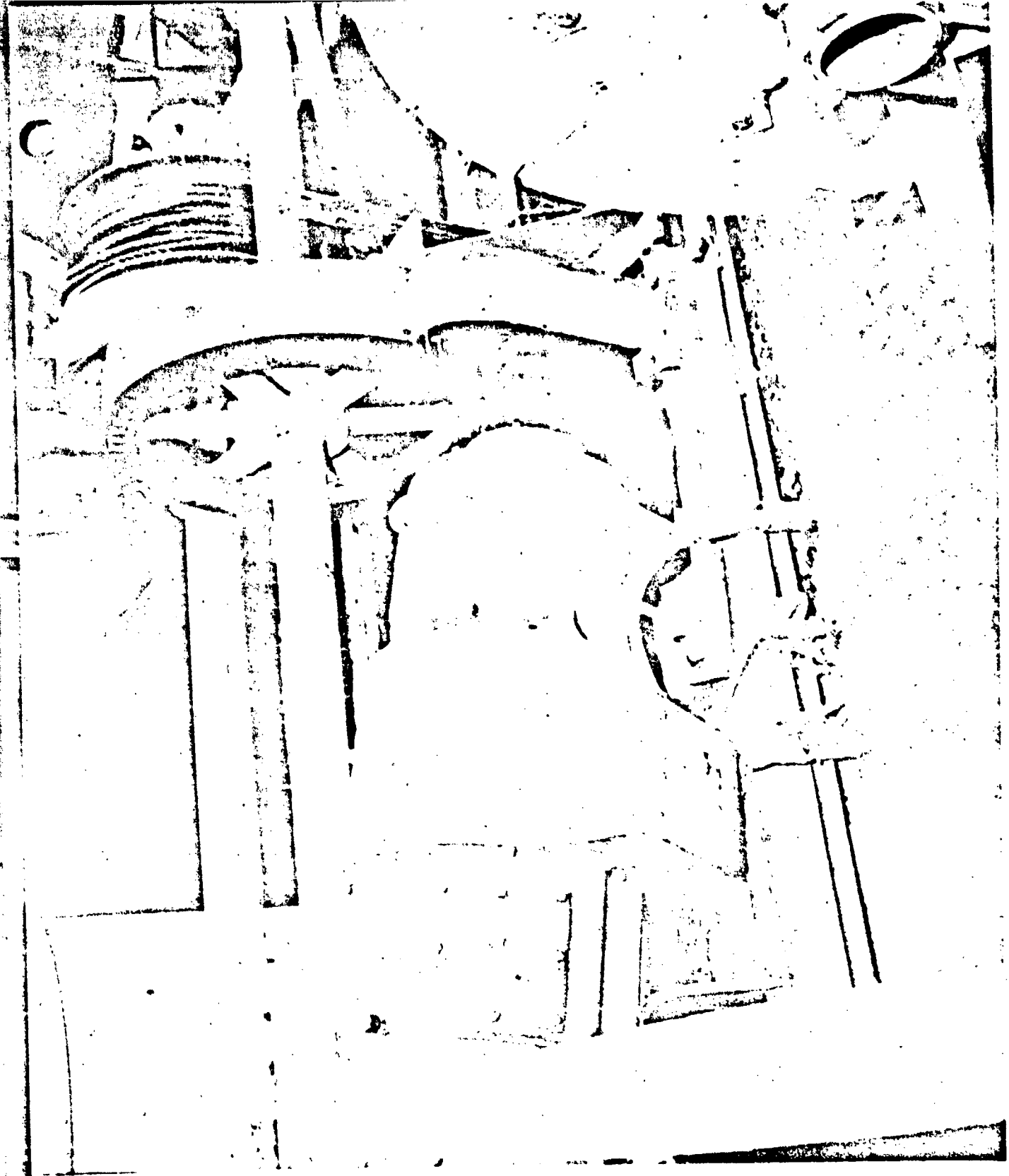
AB-CR-82-4219-4. Main deck. Looking aft along port deck edge from about frame 15 showing damage to life rails and lines.



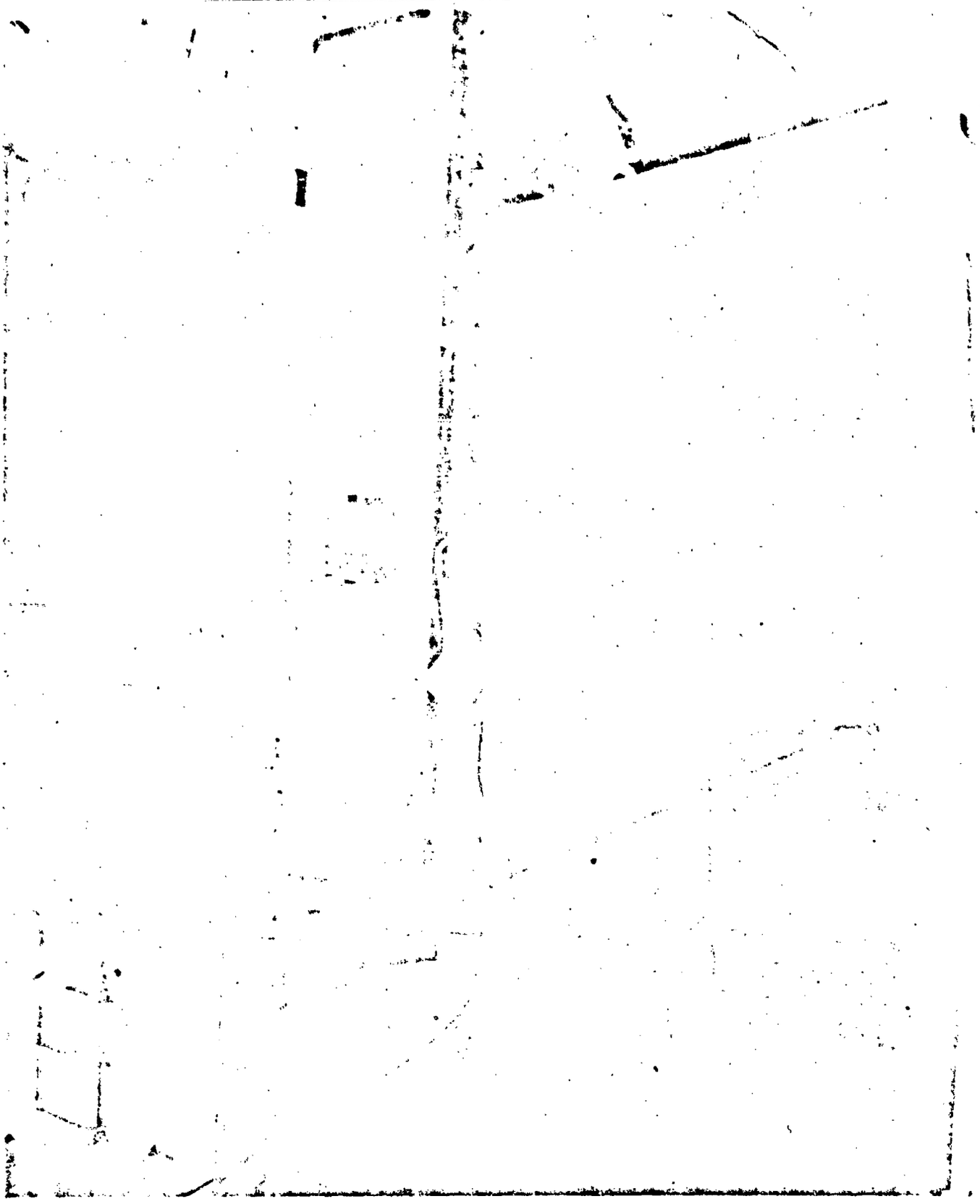
AB-CR-82-4218-2. Main deck, detail of port elevator sheave and broken cable.



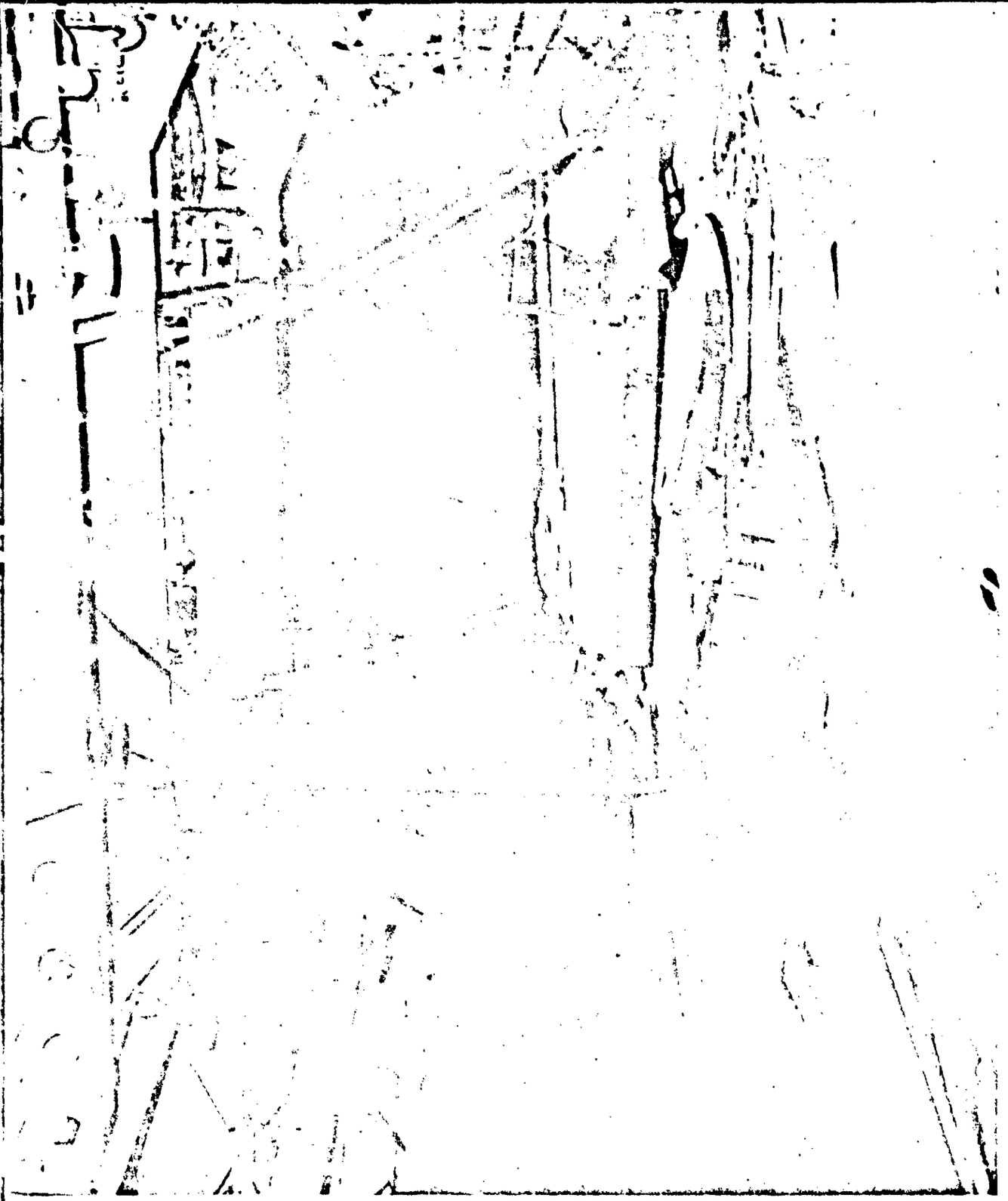
AB-CR-82-4218-3. Main deck. Detail of starboard elevator sheave.



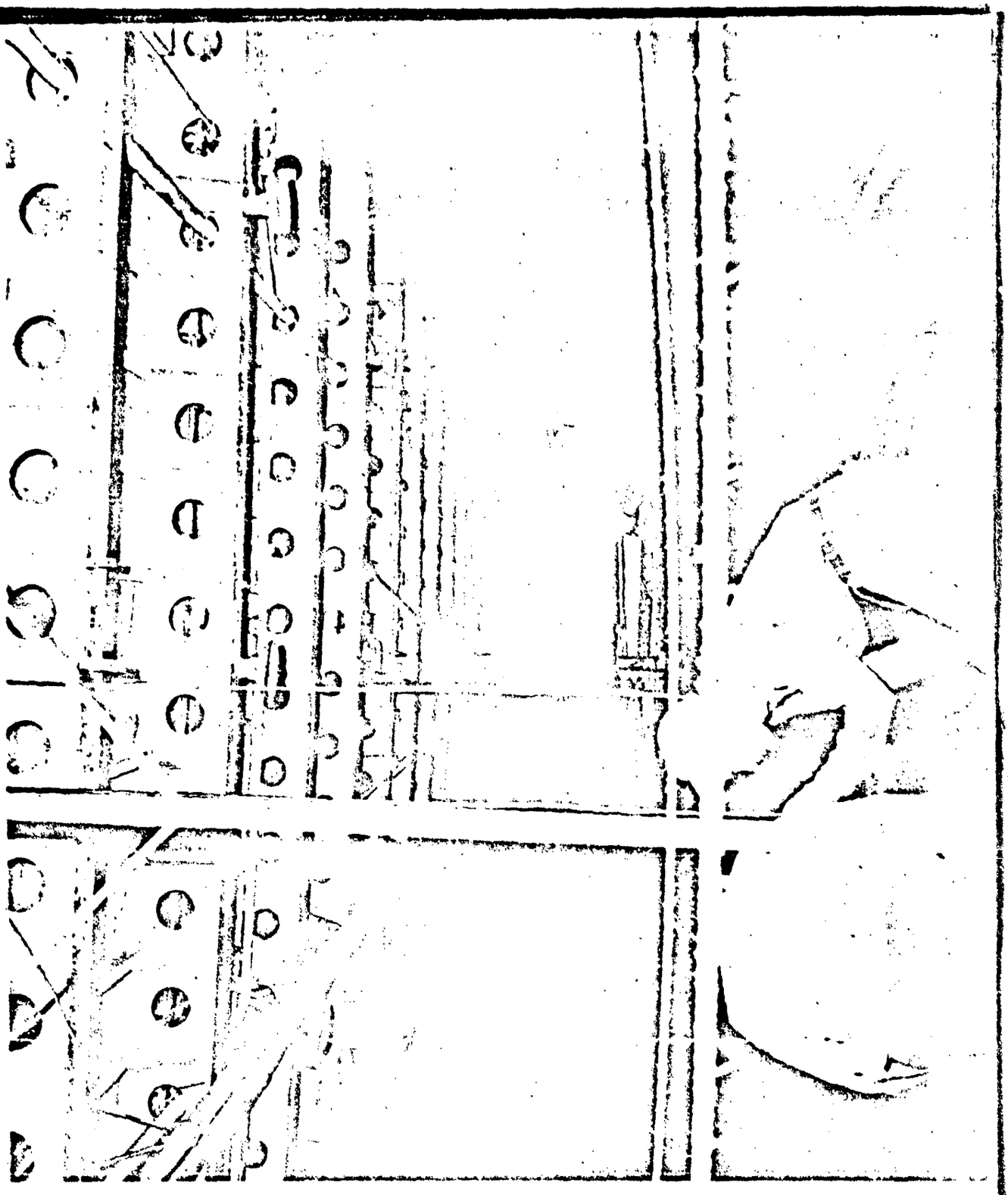
AB-CR-82-4218-12. Main deck. Detail of damage to elevator hoist machinery.



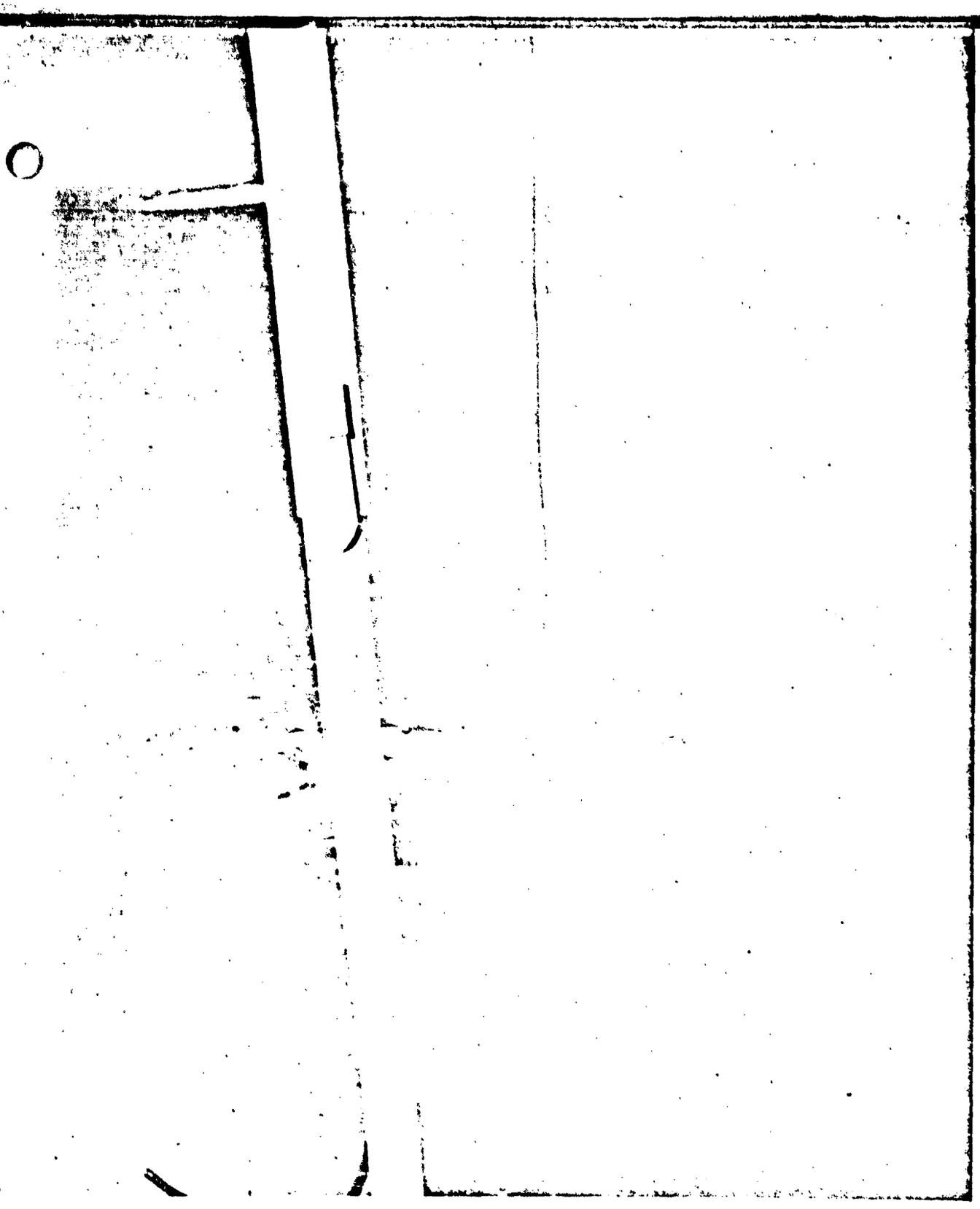
AB-CR-82-4218-1. Looking down through main deck at damaged forward elevator. Elevator was at main deck before test. Elevator stops, visible along fore and aft coaming, failed in shear or bent.



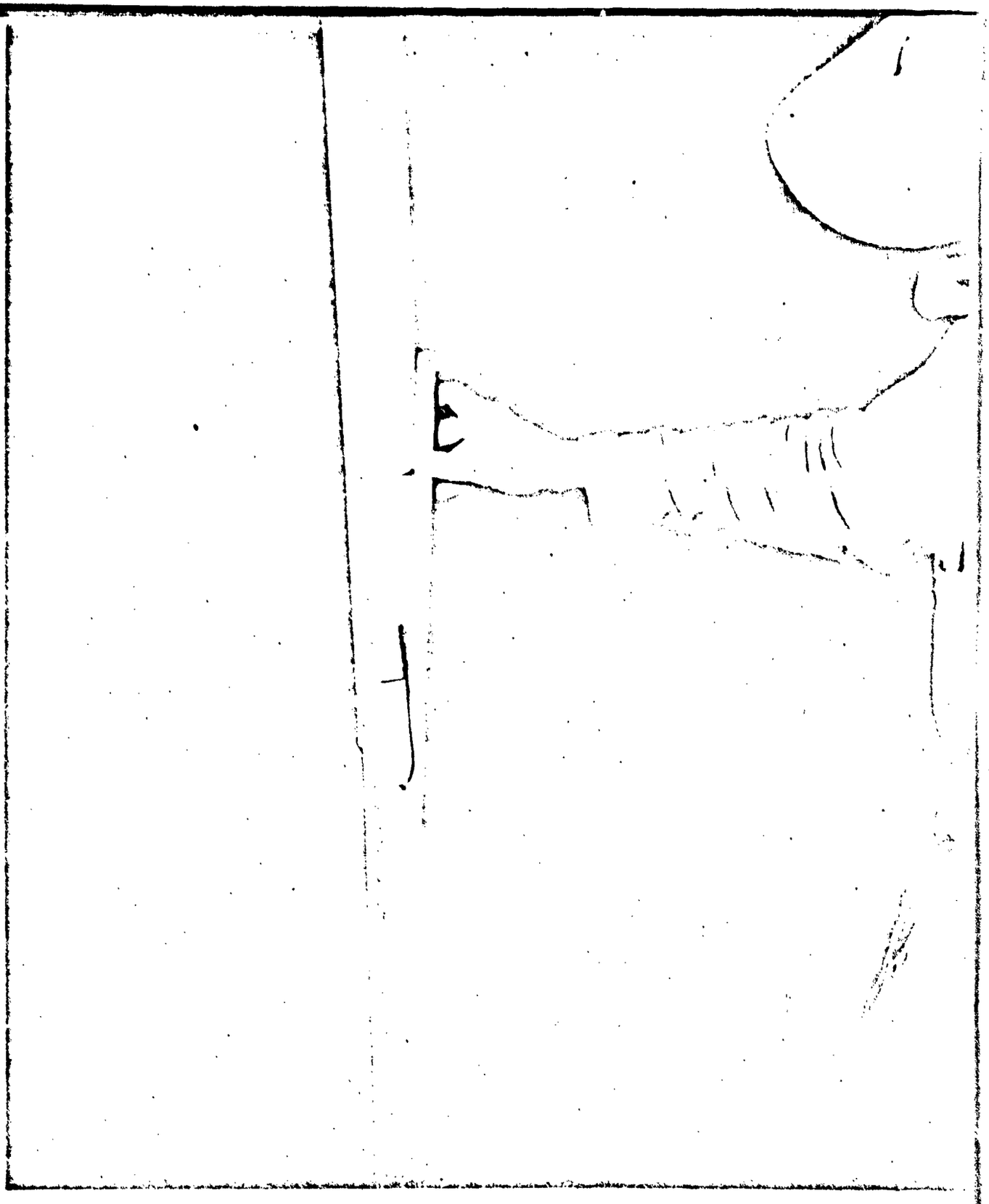
AB-CR-82-4220-3. Third deck. Forward portion of tank space, showing damaged elevator. Water was shipped aboard during test.



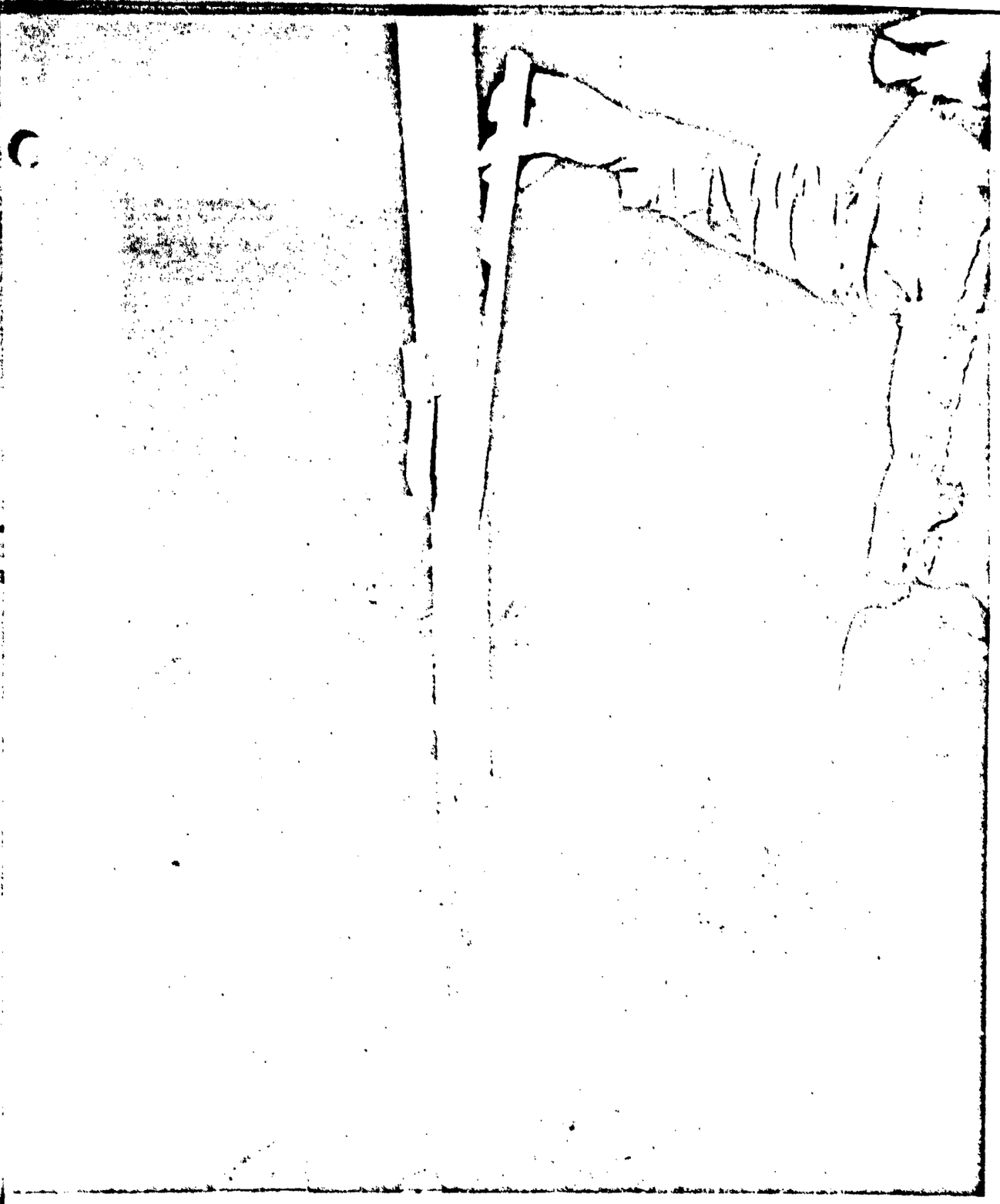
AB-CR-82-4219-11. Tank space. Looking forward from under after hatch, showing deflection of transverse deck girders under main deck.



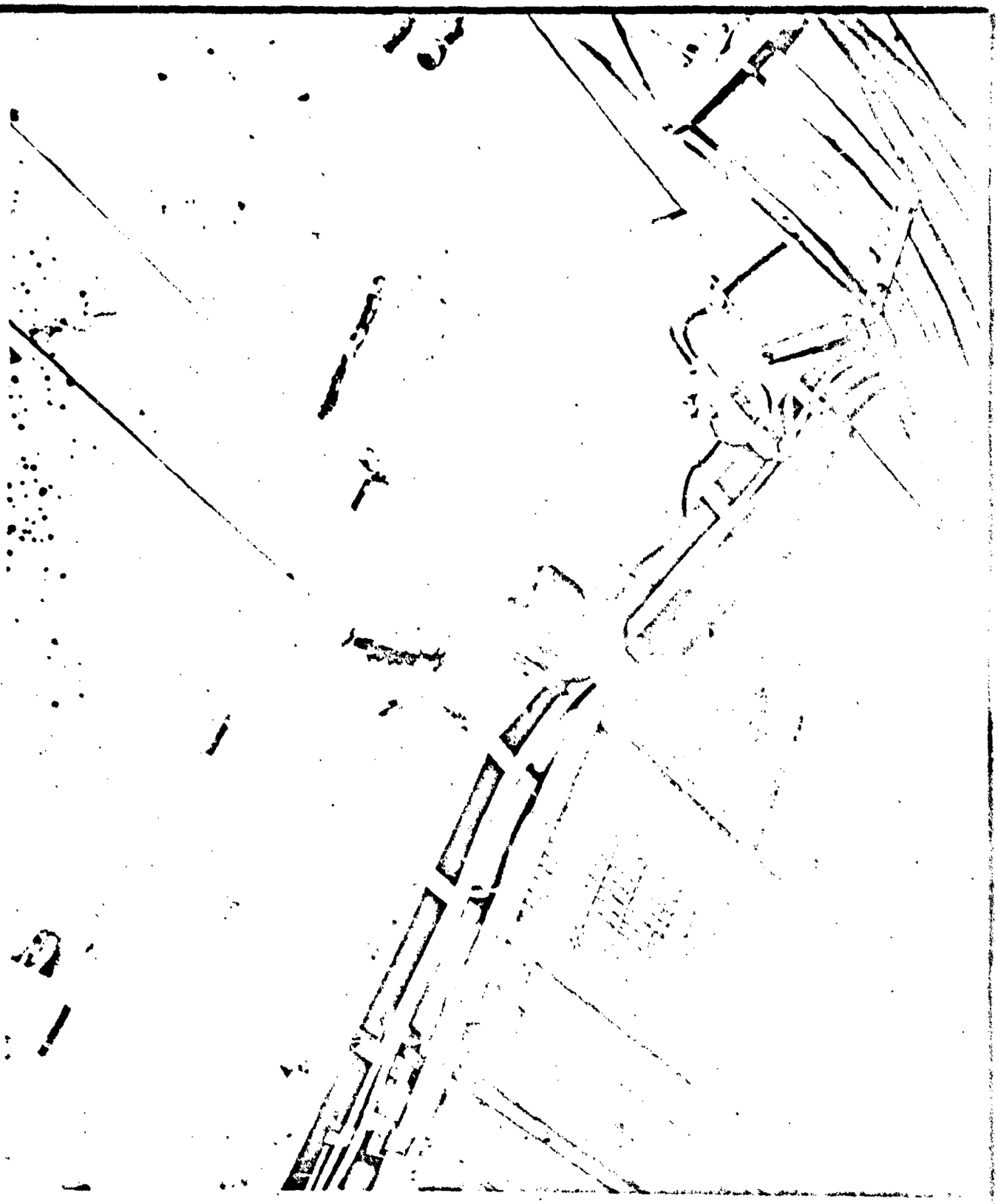
AB-CR-82-4219-12. Scratch gage at frame 27, centerline, between main and third decks in tank space. Elastic recovery of main deck measured about 2 inches.



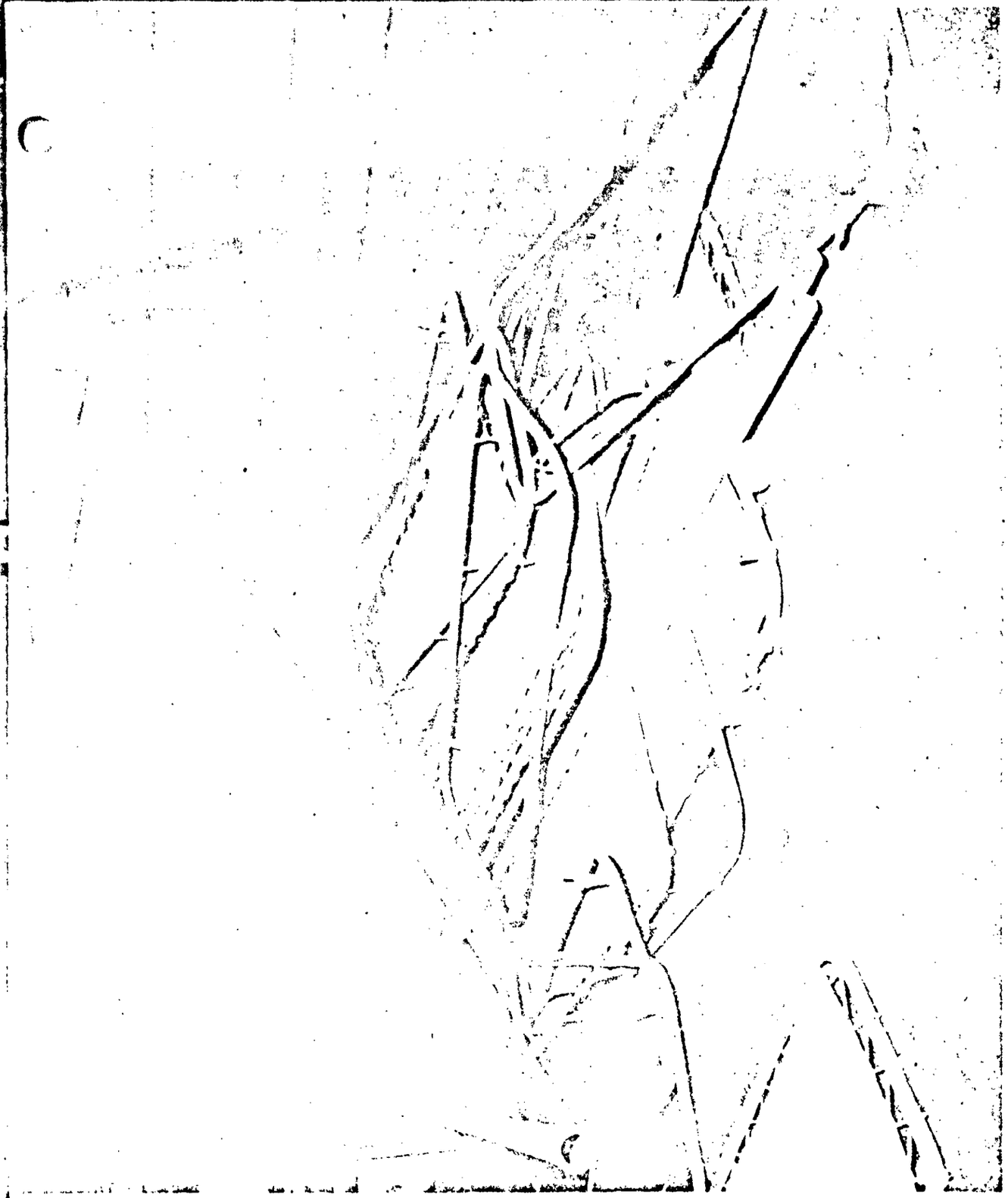
AB-CR-82-4220-1. Scratch gage at frame 23, centerline, between main and third decks in tank space. Main deck showed elastic recovery of about 2 1/2 inches.



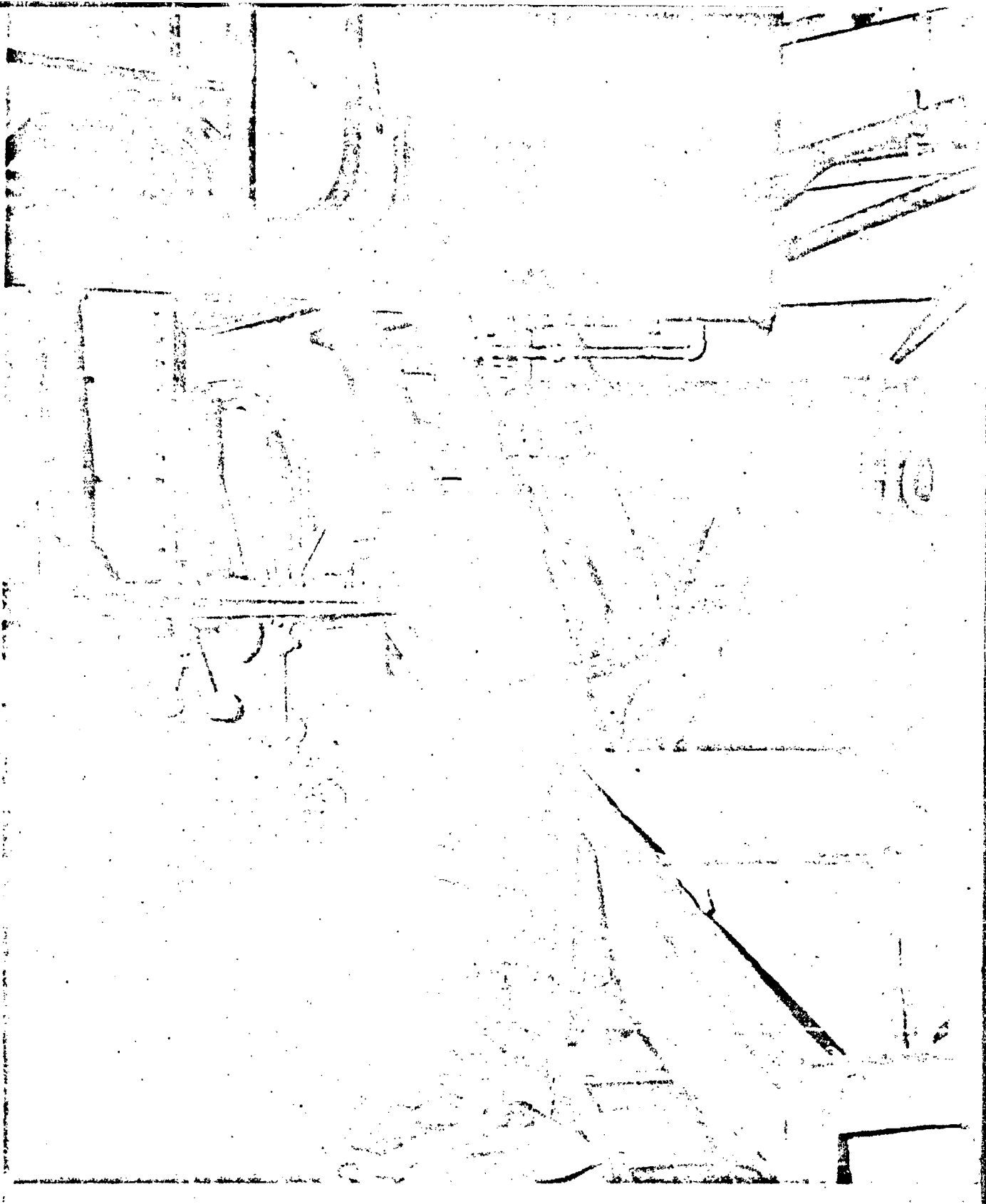
AB-CR-82-4220-2. Scratch gage at frame 20, centerline, between main and third decks in tank space. Elastic recovery of main deck measured 3 inches.



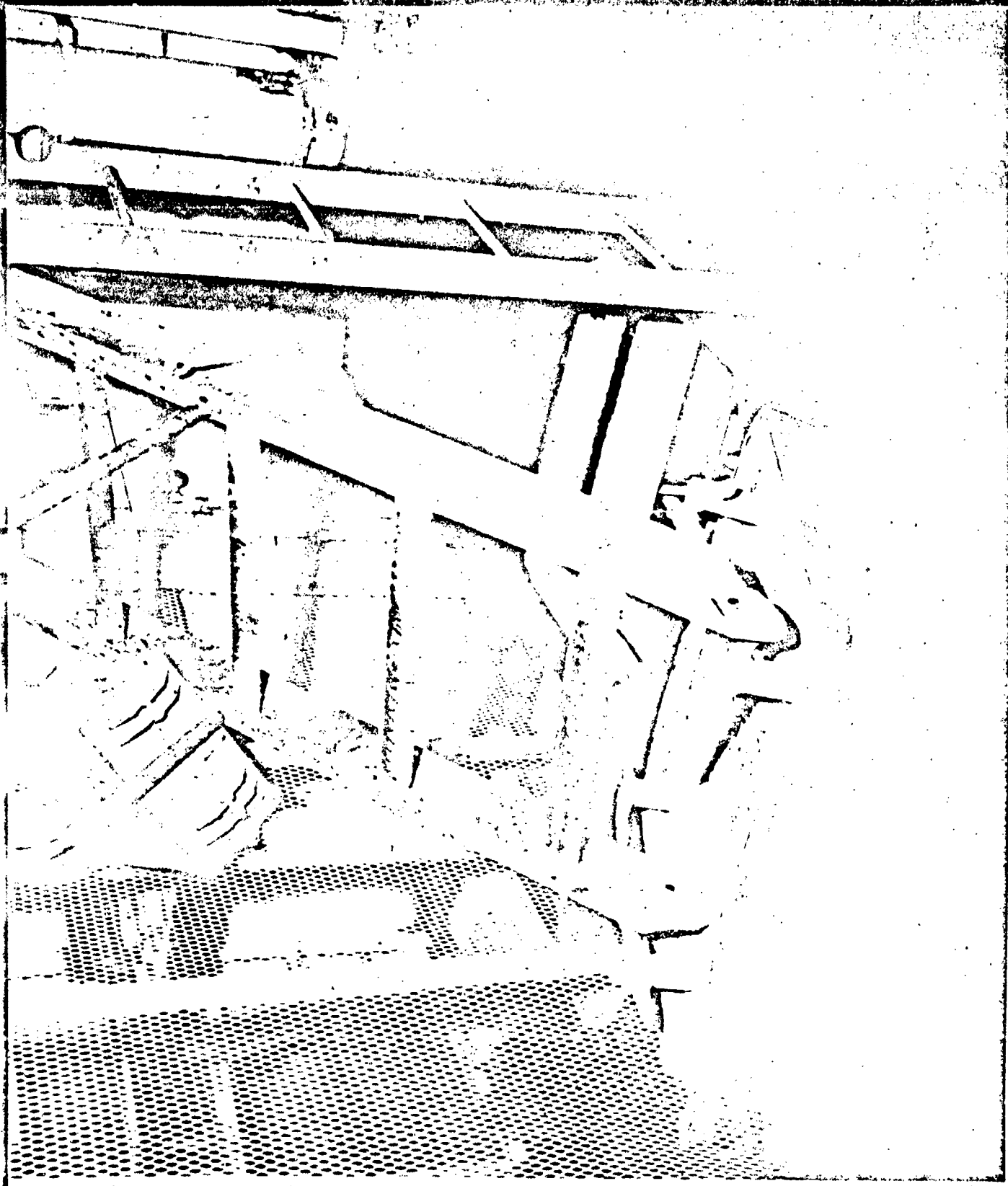
AB-CR-82-4219-10. Tank space. Evidence of strain in transverse beam 28 under main deck, where bracketed to tank space longitudinal bulkhead on starboard side. Looking forward, upward and to starboard. This girder is the forward hatch-end beam of the after hatch.



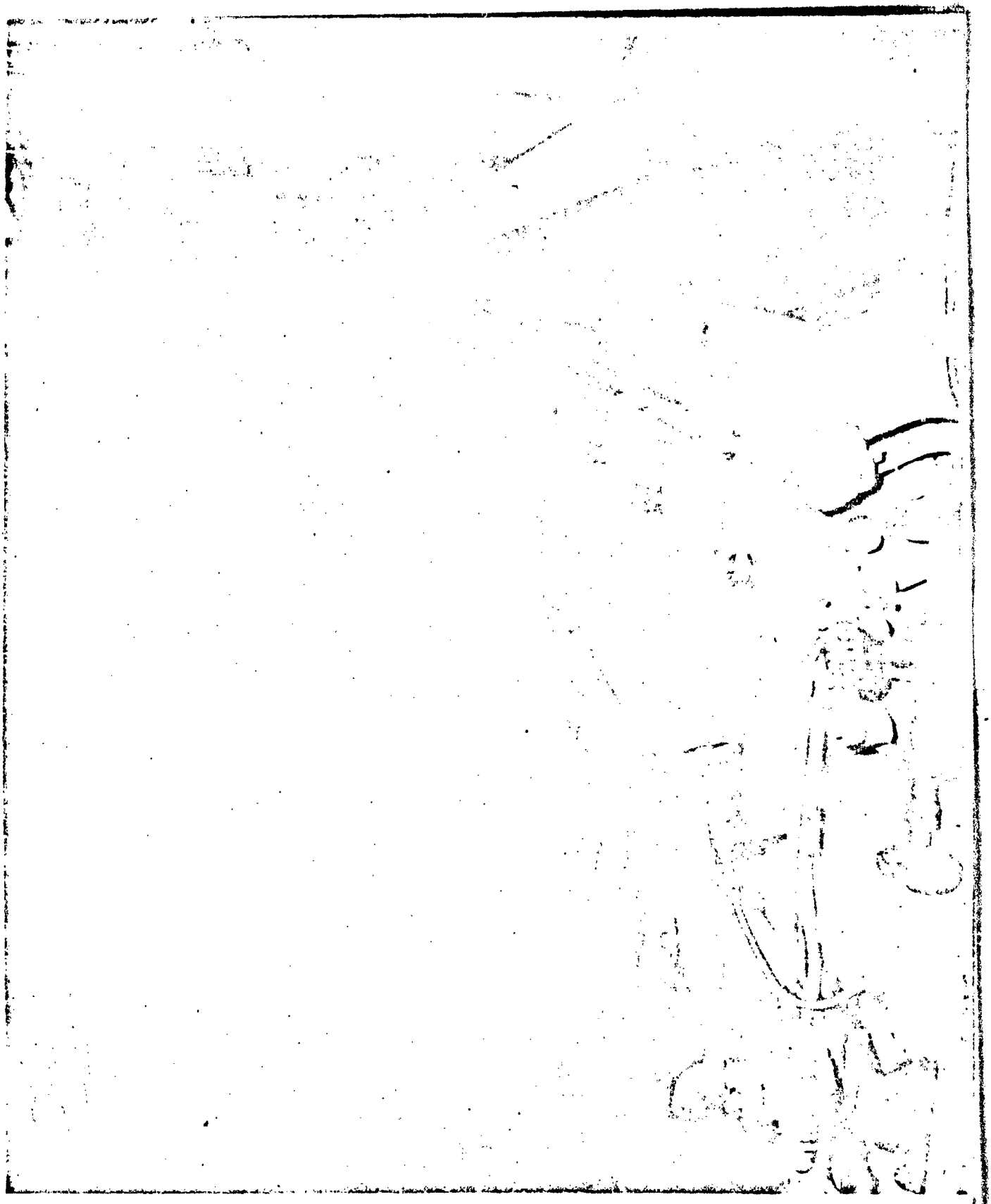
AB-CR-82-4219-9. Tank space. Looking aft and to port from about frame 36, centerline. Showing equipment dislodged from bulkhead stowage. Photo 4219-8 shows area in upper left.



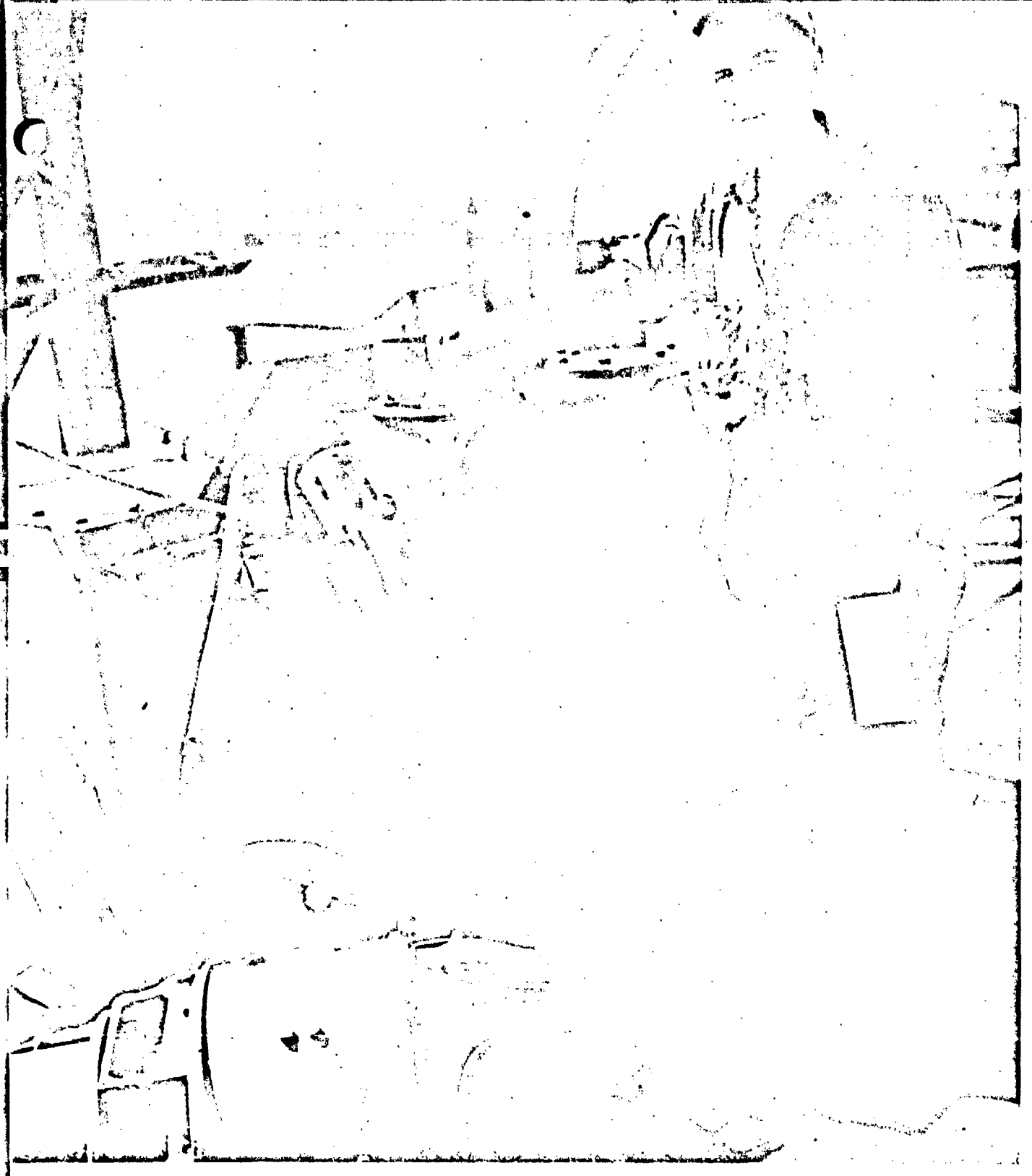
AB-CR-82-4219-8. Looking aft and to port in after port corner of tank space. Note dislodged ladder and disarray of equipment.



AB-CR-82-4220-4. C-305-AE, refrigerator machinery space. Evidence of underwater shock effect. Ladder was lifted and hatch undogged, with ladder coming to rest on open hatch cover. Note also expanded metal bulkhead torn at base and dislodged general announcing speaker.

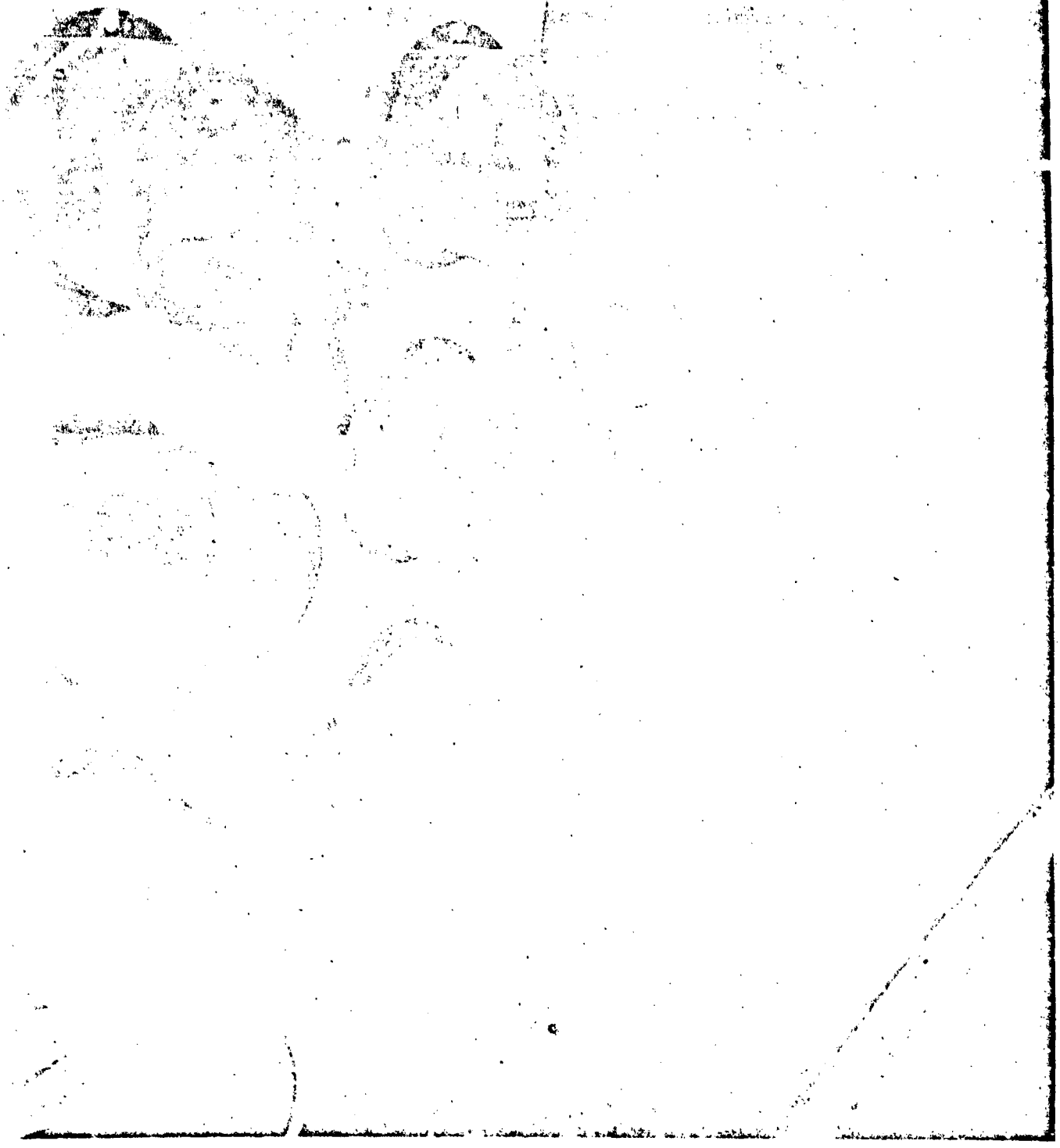


AB-CR-68-2983-4. Displaced main engine covers.



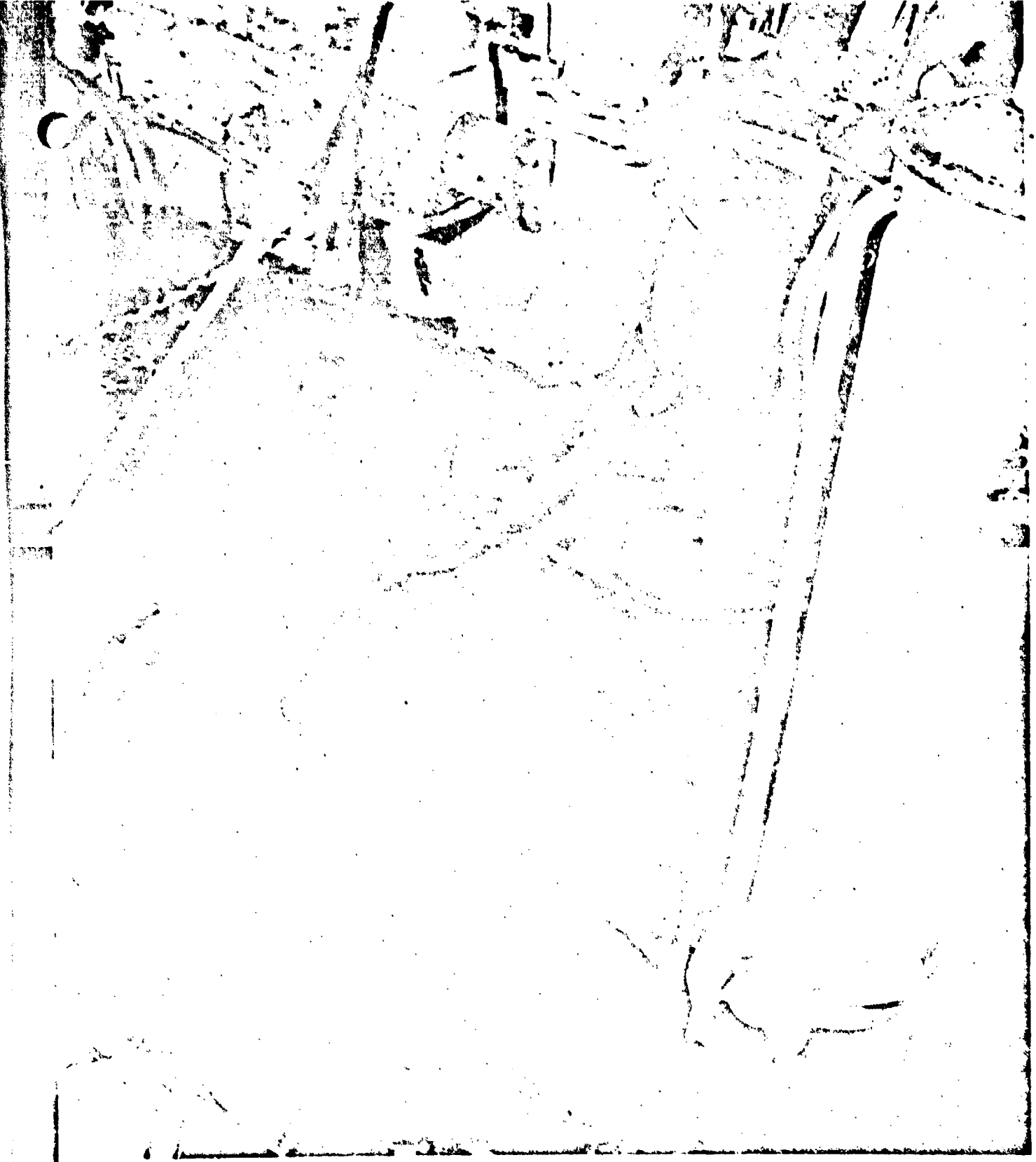
AB-CR-100-2991-12. Davit motor, forward starboard davit.

AB-CR-100-2991-9. Elevator platform on deck below.

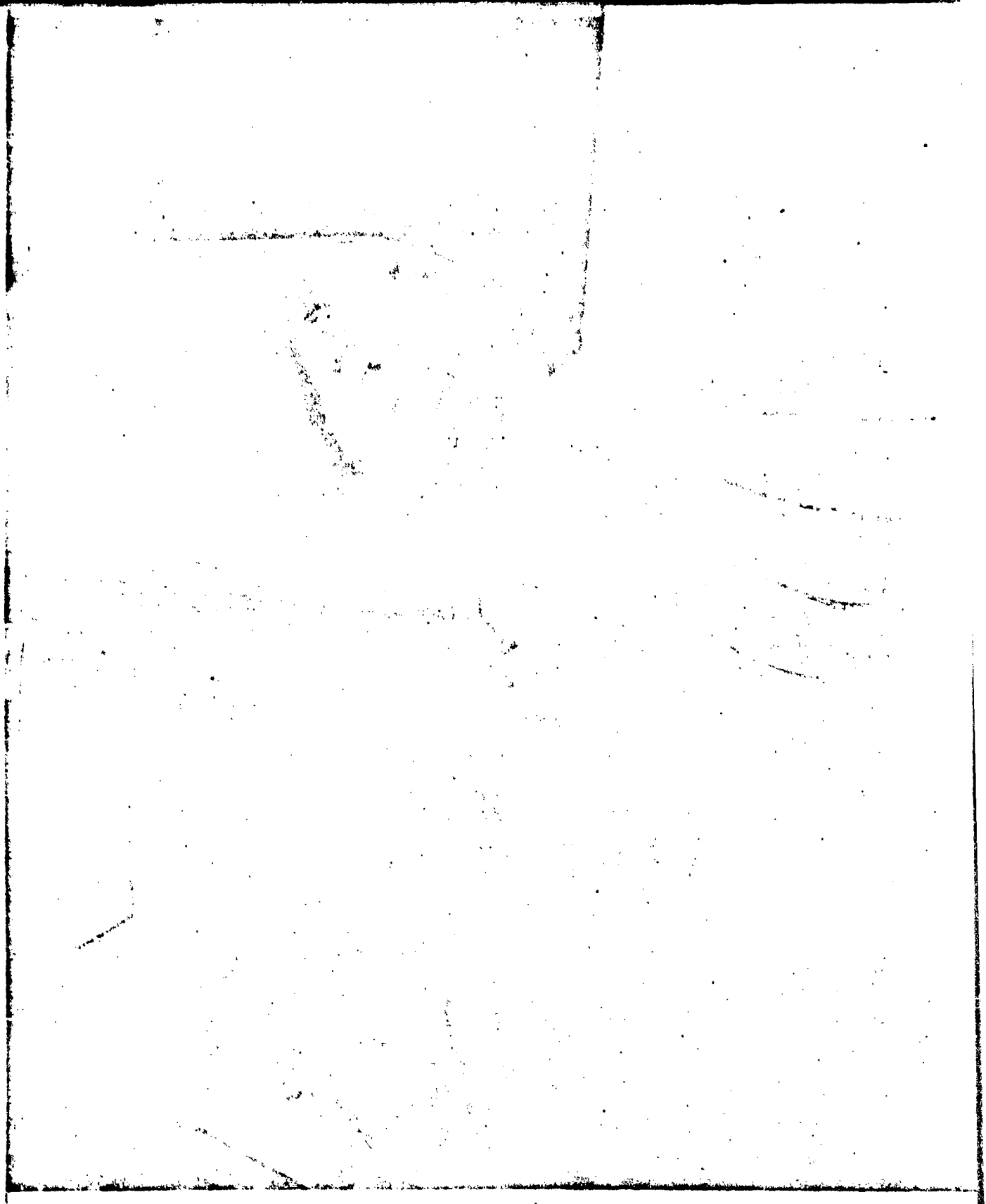


AB-CR-68-2948-12. Starboard diesel generator gage board.

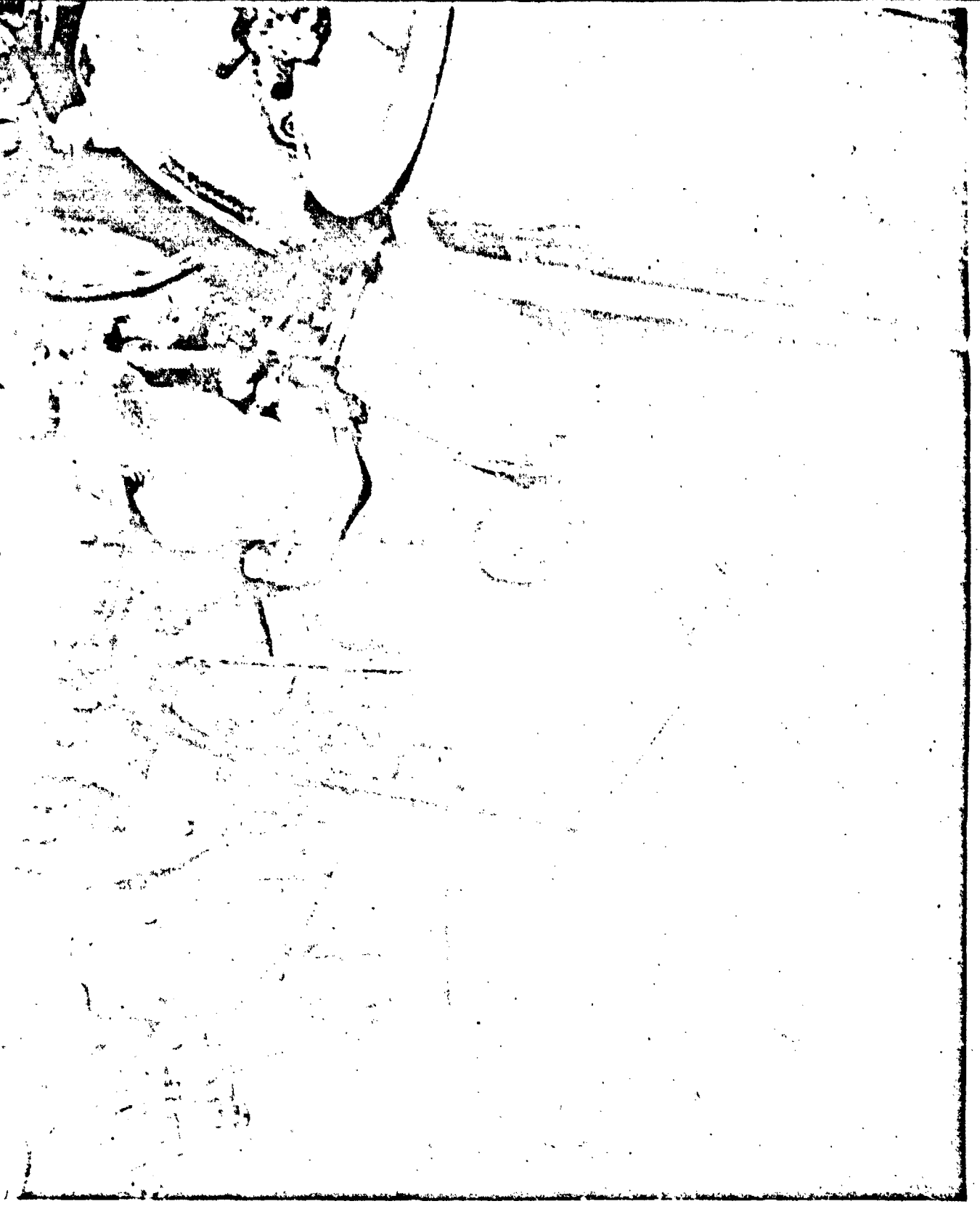
AB-CR-68-2984-12. Heat exchanger fresh water line.



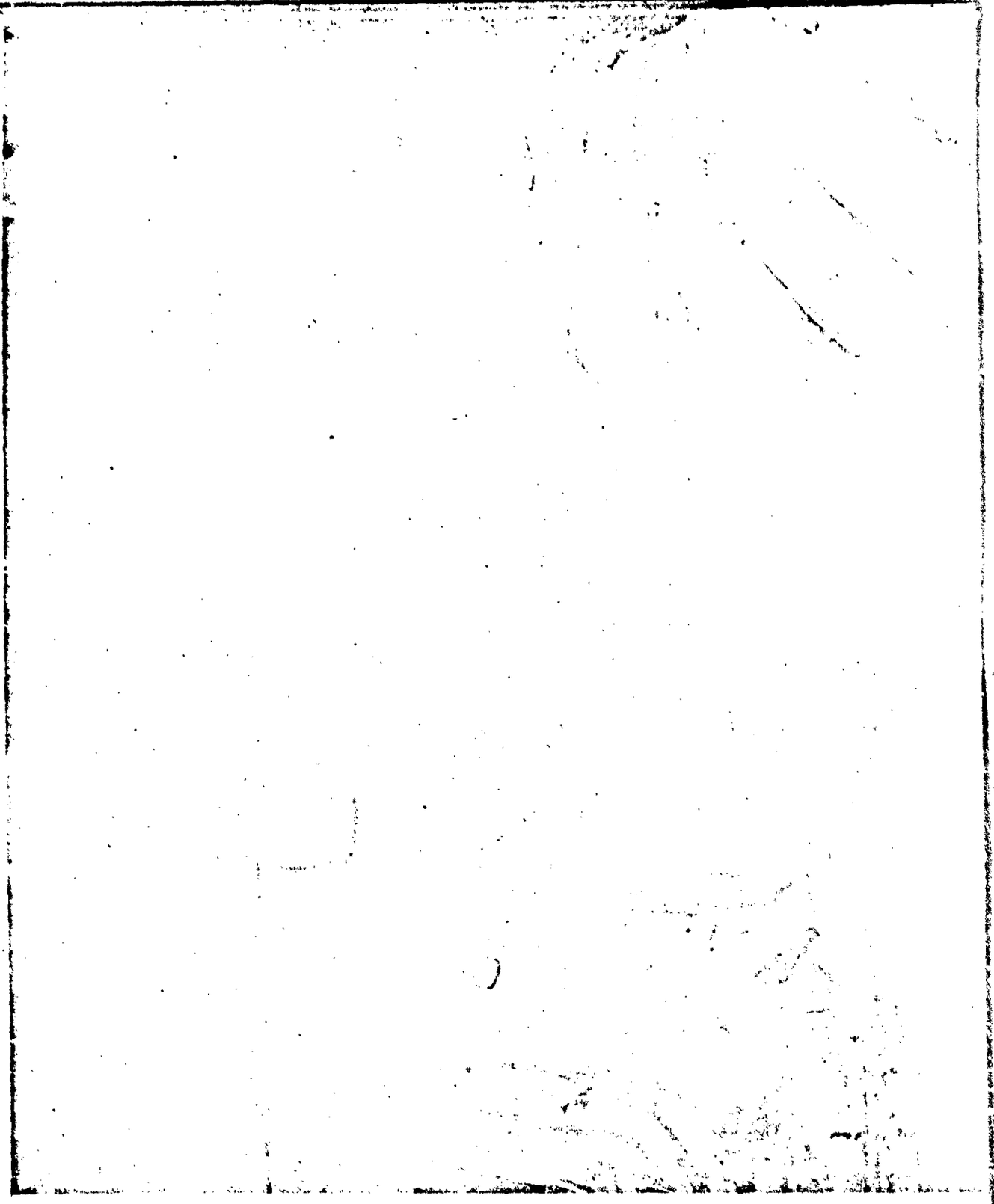
AB-CR-68-2983-1. Broken piping - auxiliary diesel generator.



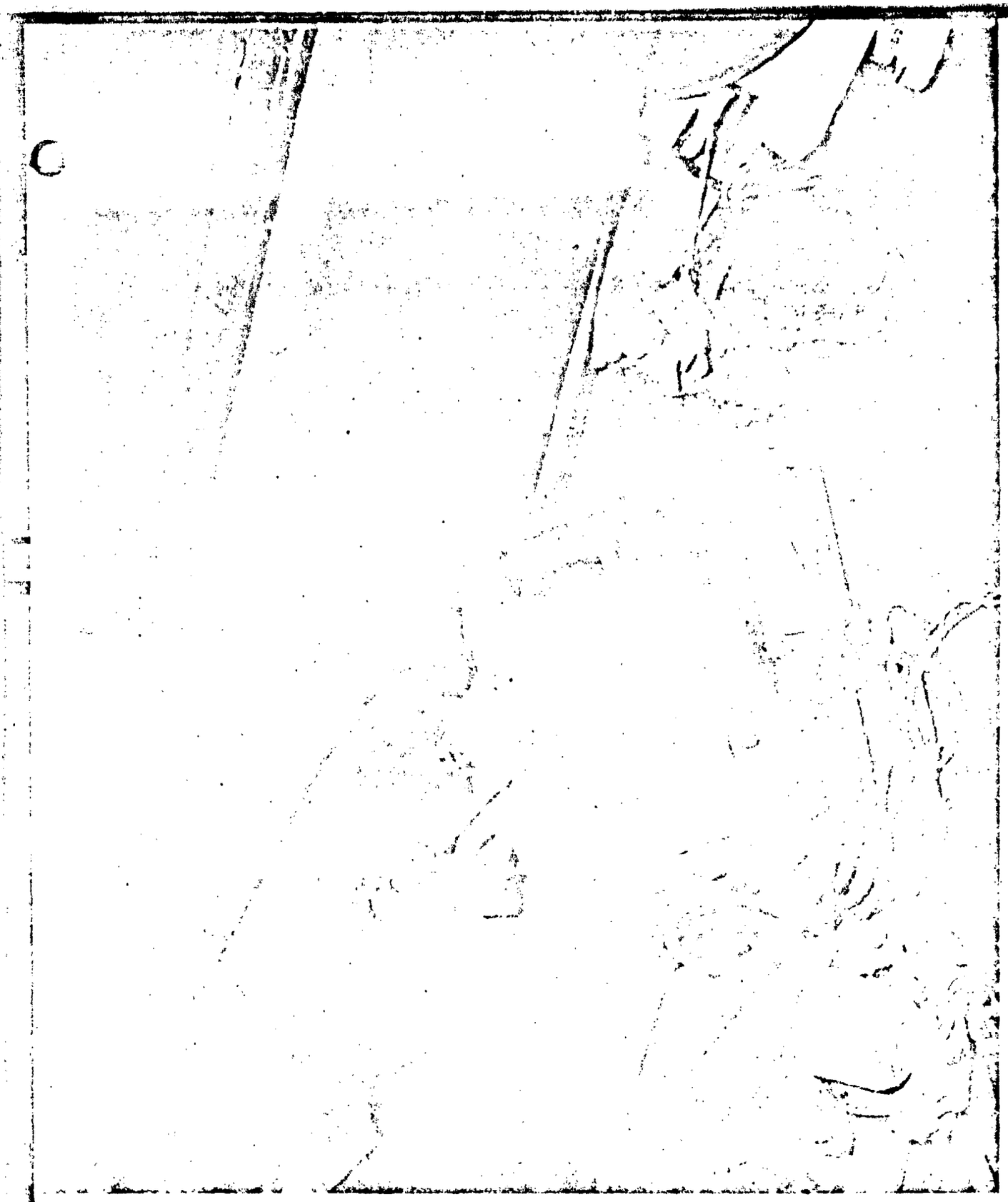
AB-CR-68-2984-4. Damaged auxiliary engine exhaust.



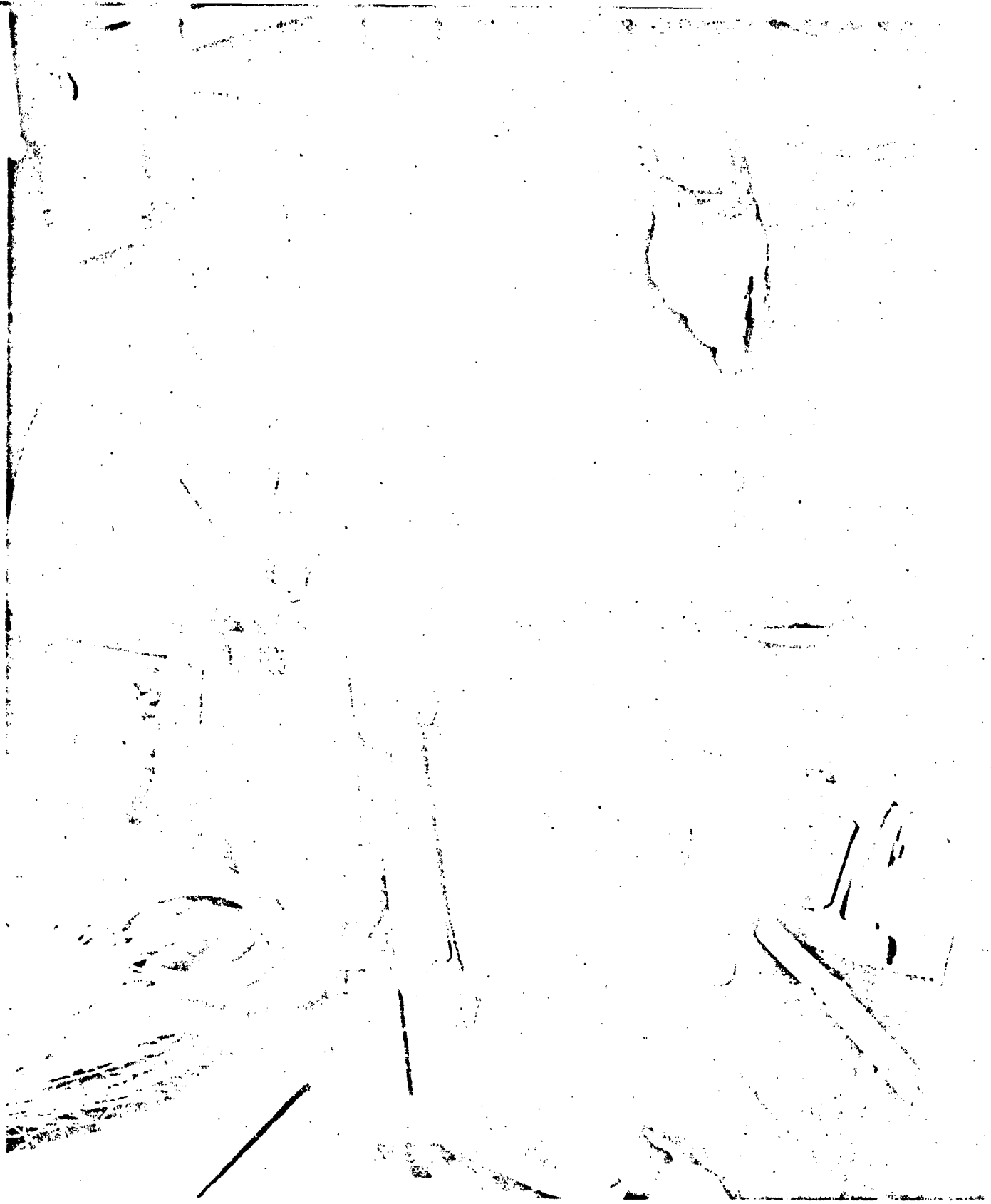
AB-CR-68-2984-2. Damaged piping auxiliary diesel generator.



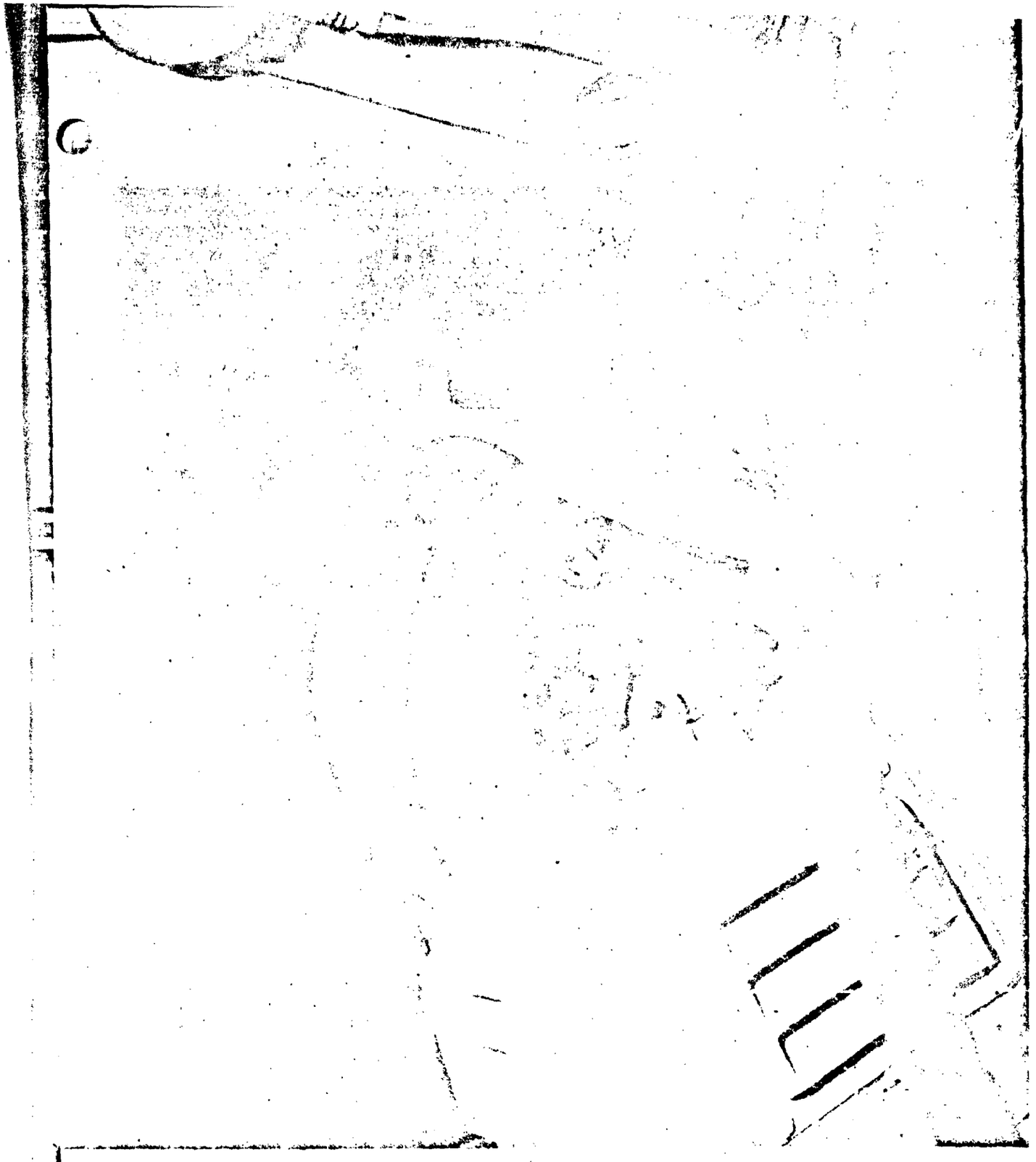
AB-CR-68-2984-6. Diesel generator engine exhaust.



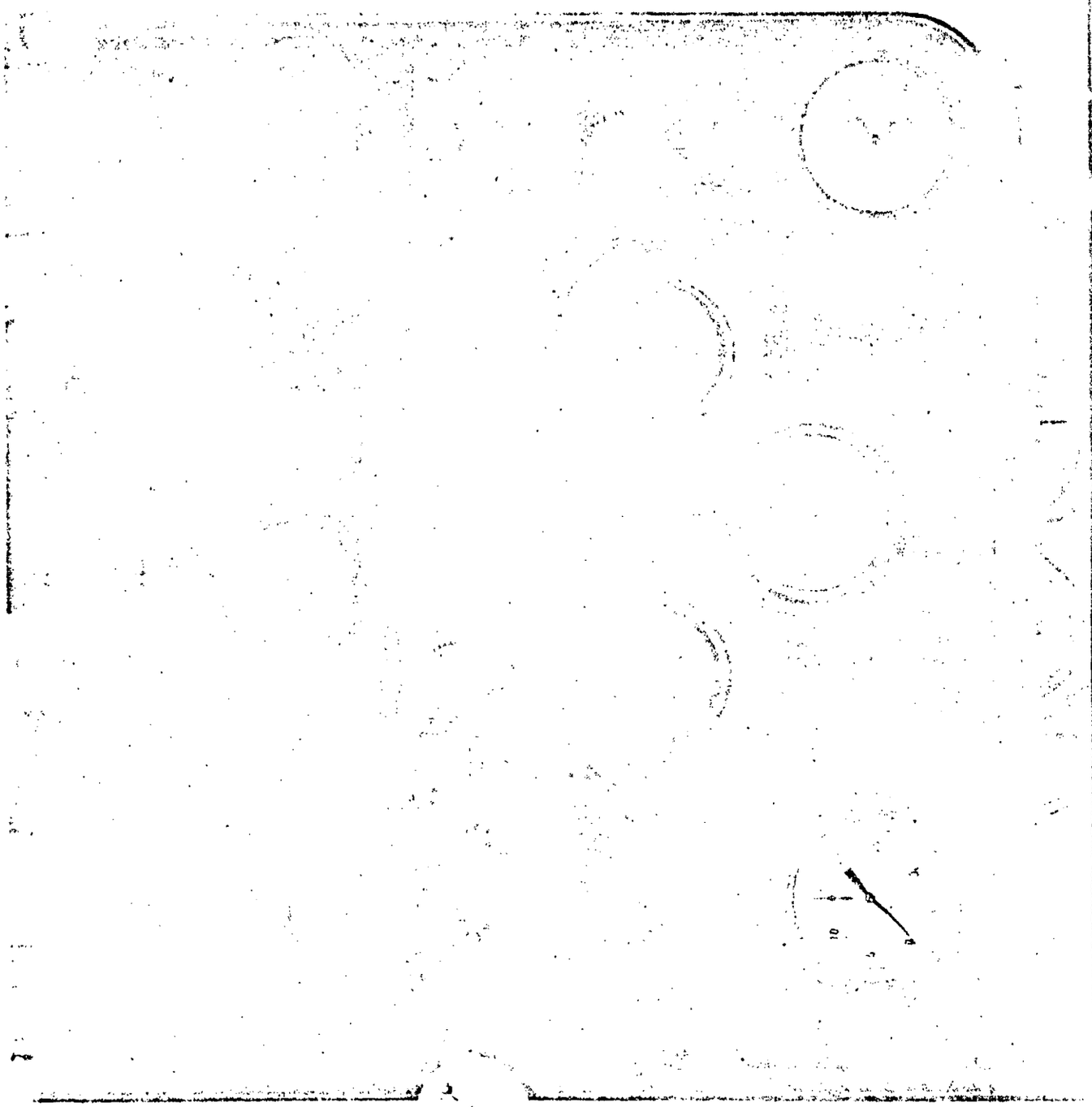
AB-CR-68-2983-6. Jap lathe motor.



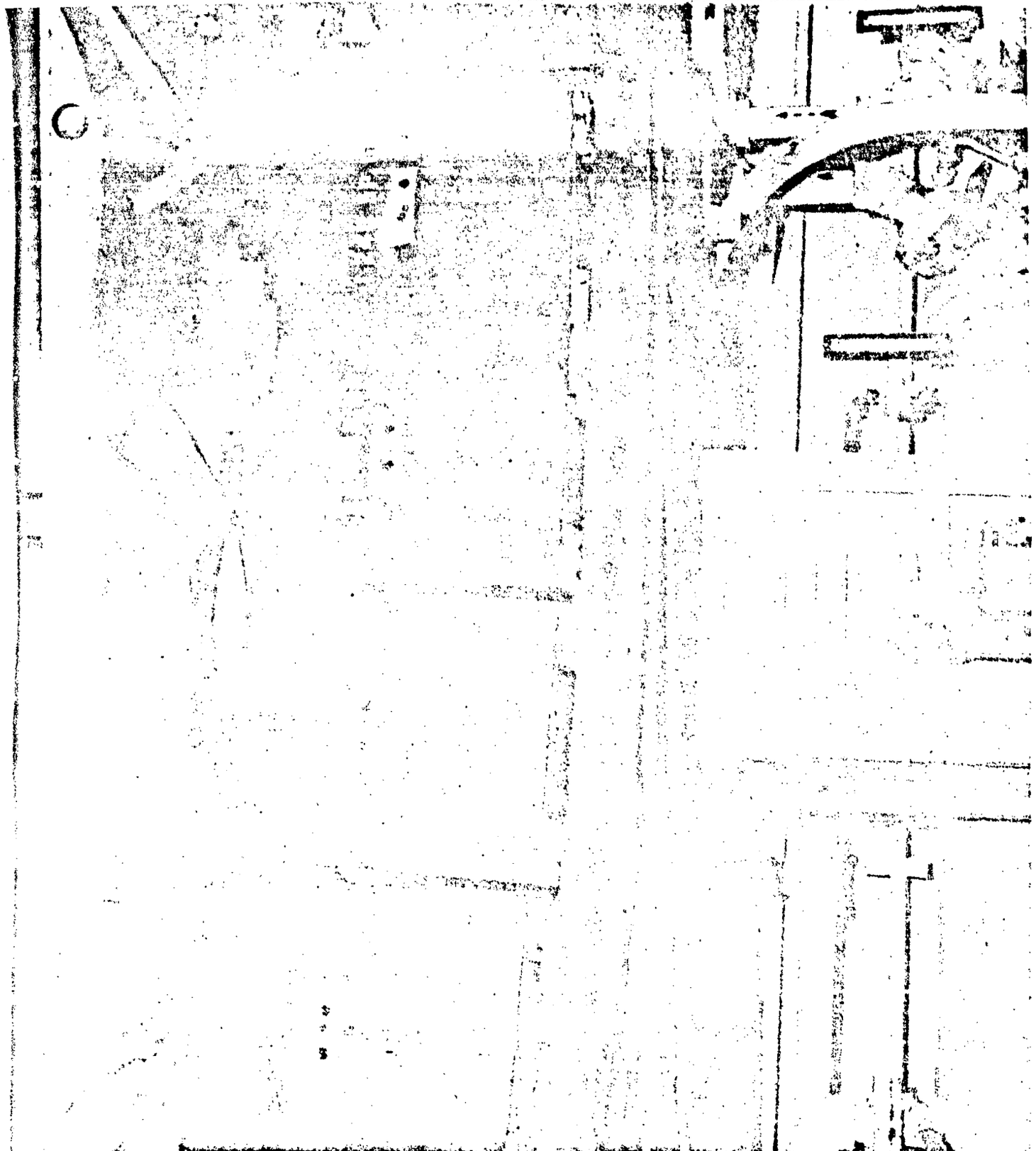
AB-CR-68-2983-7. Jap lathe overturned in machine shop.



AB-CR-68-2948-10. Port vertical ballast pump mounted in the auxiliary engine room. Shows pump cracked off its mounting base. Picture taken looking aft.

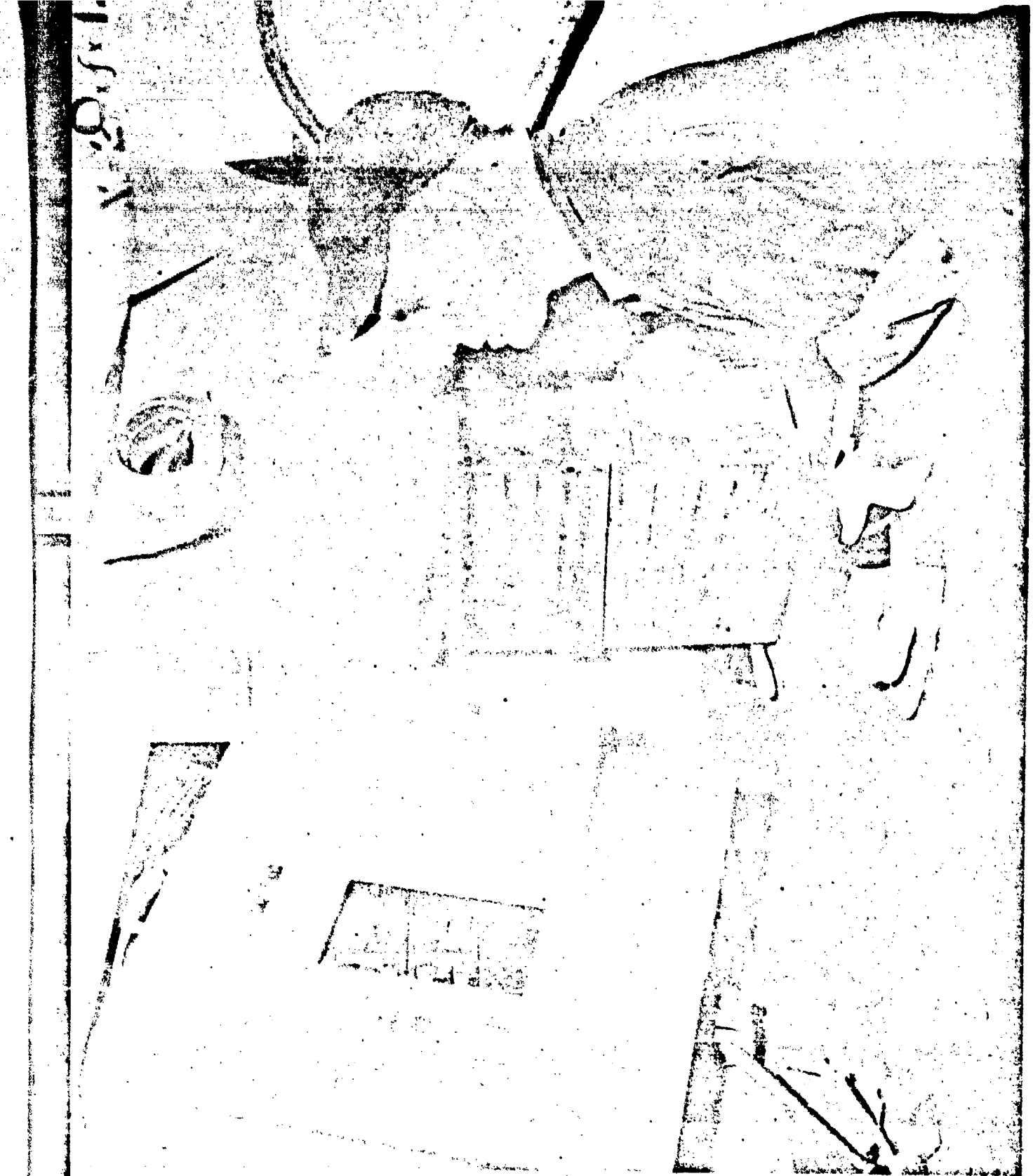


AB-CR-68-2983-2. Main gauge board installed in propulsion engine room. Shows R.P.M. indicator dislodged from the gauge board. Picture taken looking forward.

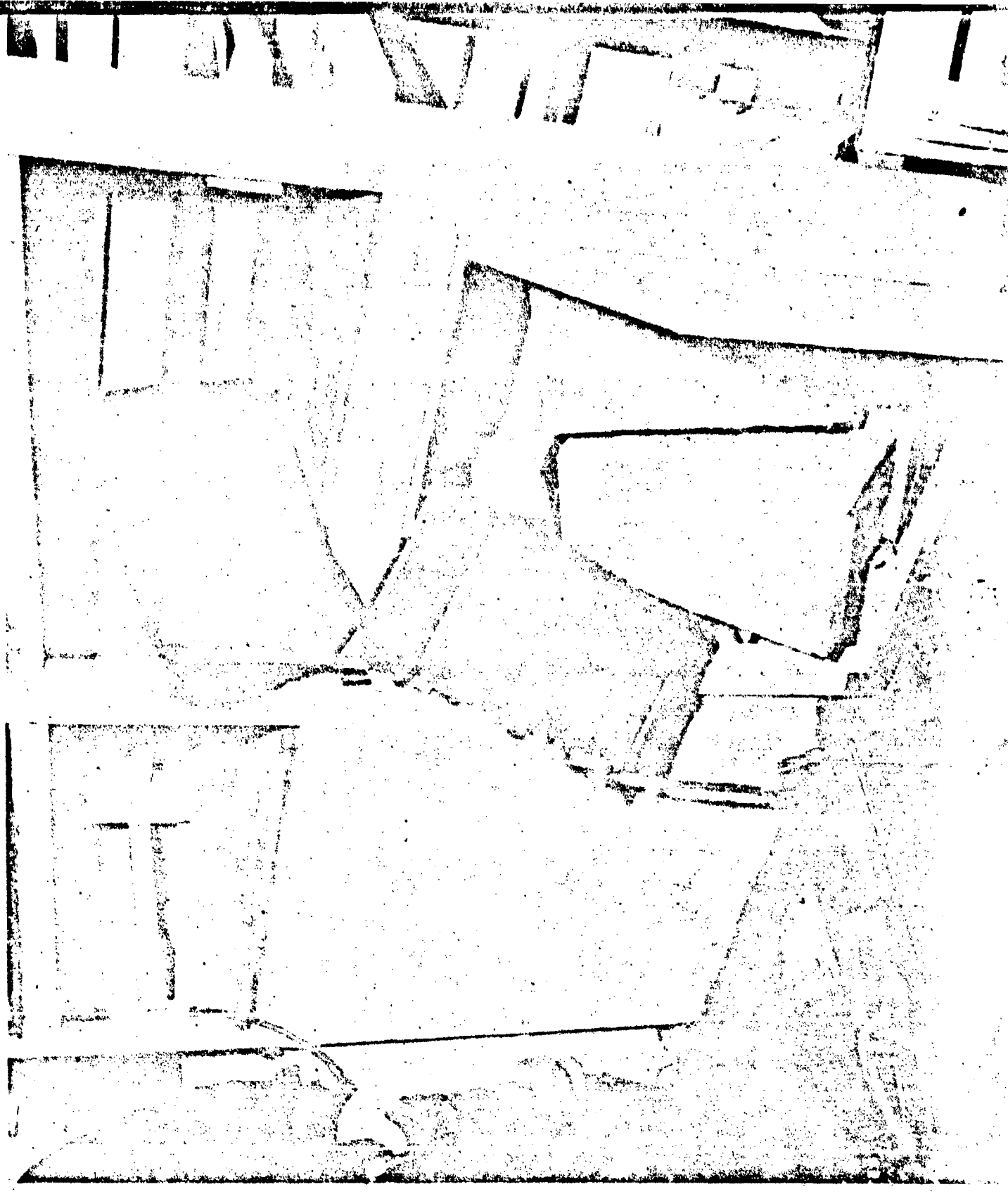


AB-CR-68-2983-3. Propulsion engine starting battery rack. Shows damage to the battery rack. Picture taken looking aft.

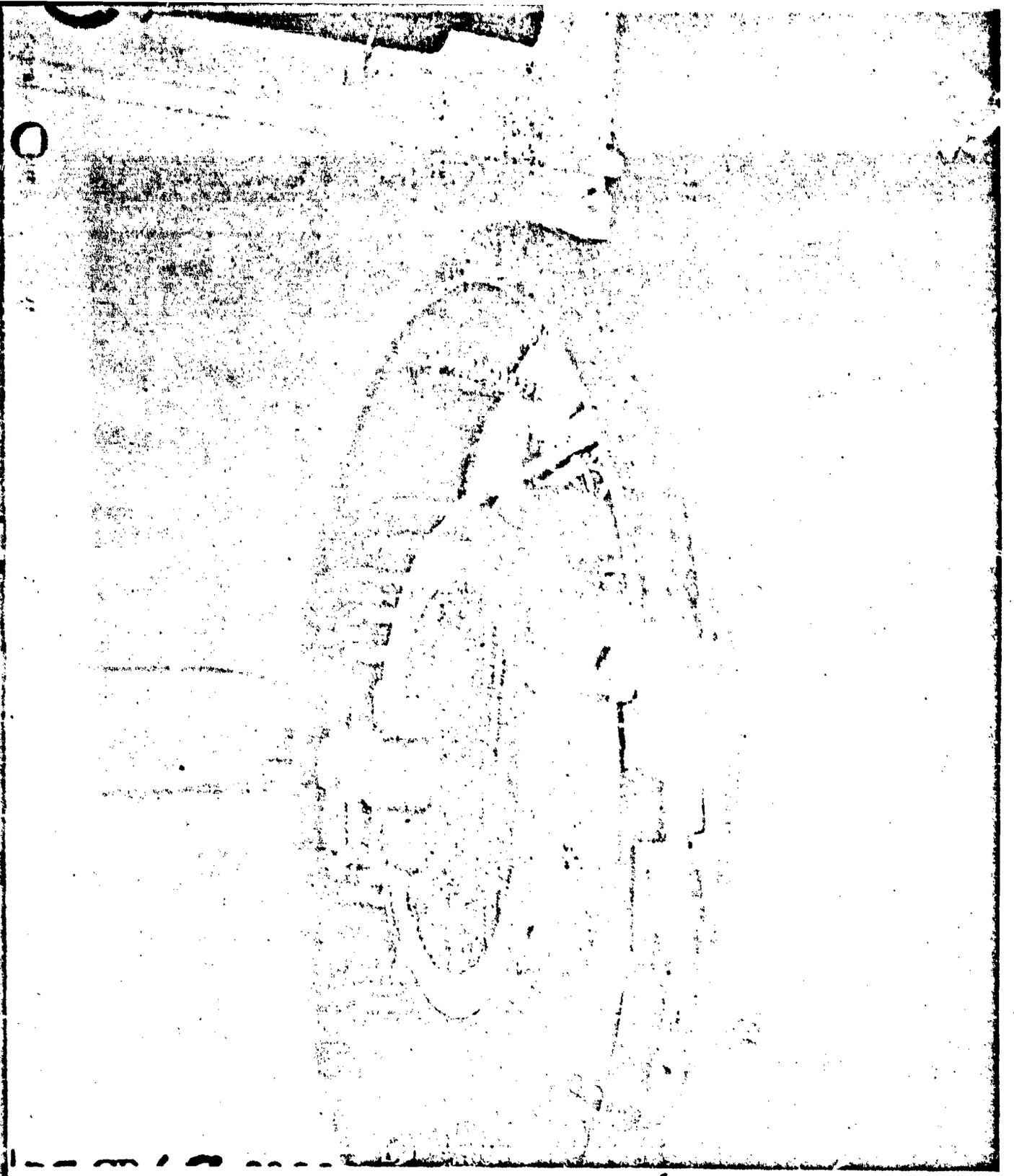
AB-CR-68-2983-5. Magnetic compass mounted in the pilot house. Shows compass dislodged from its gimbel mount. Picture taken looking forward.



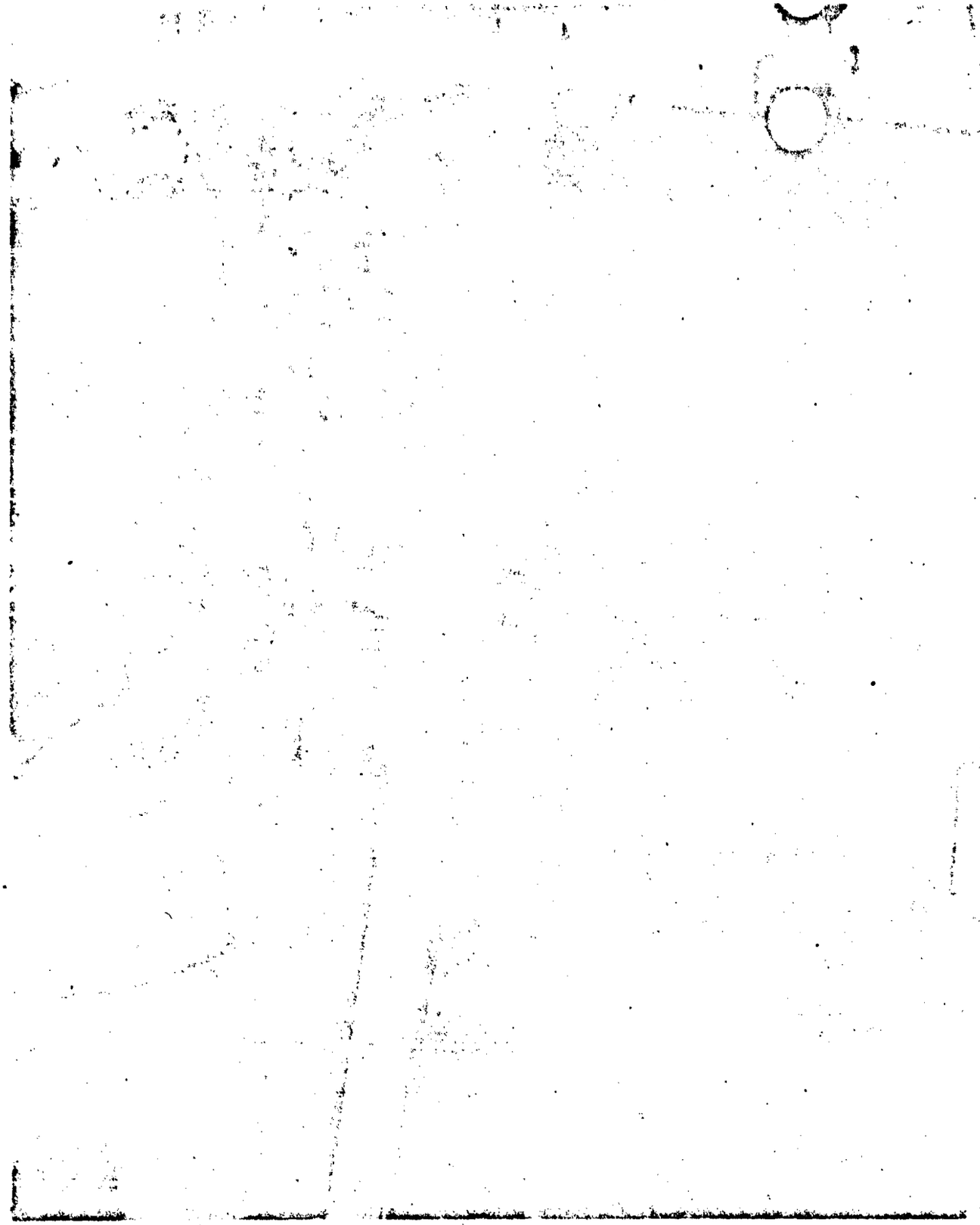
AB-CR-68-2983-8. Power panel mounted in the machine shop. Shows front cover dislodged. Picture taken looking to port.



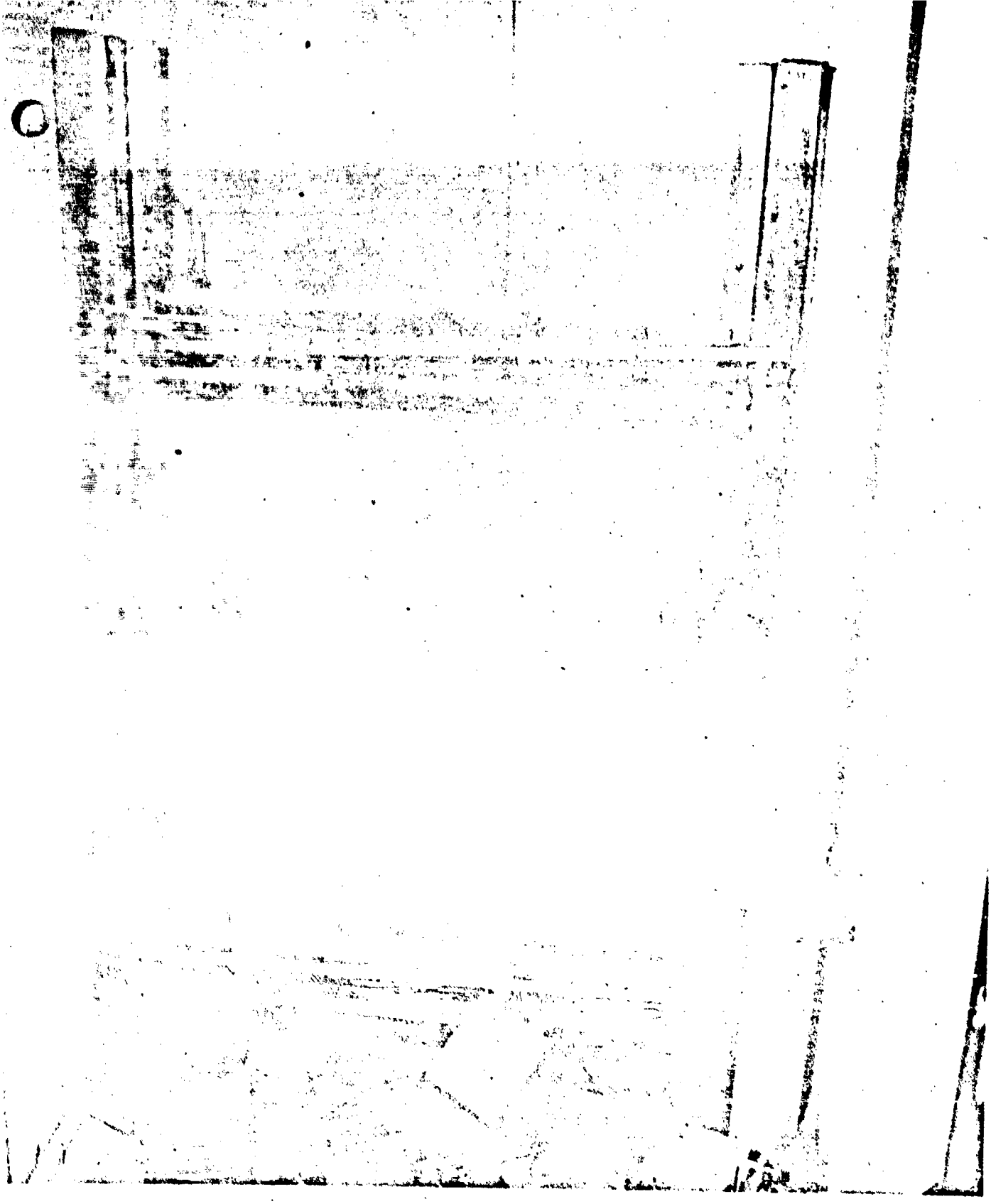
AB-CR-68-2983-9. Battery rack in the electrical shop. Shows storage batteries dislodged from their rack. Picture taken looking to starboard.



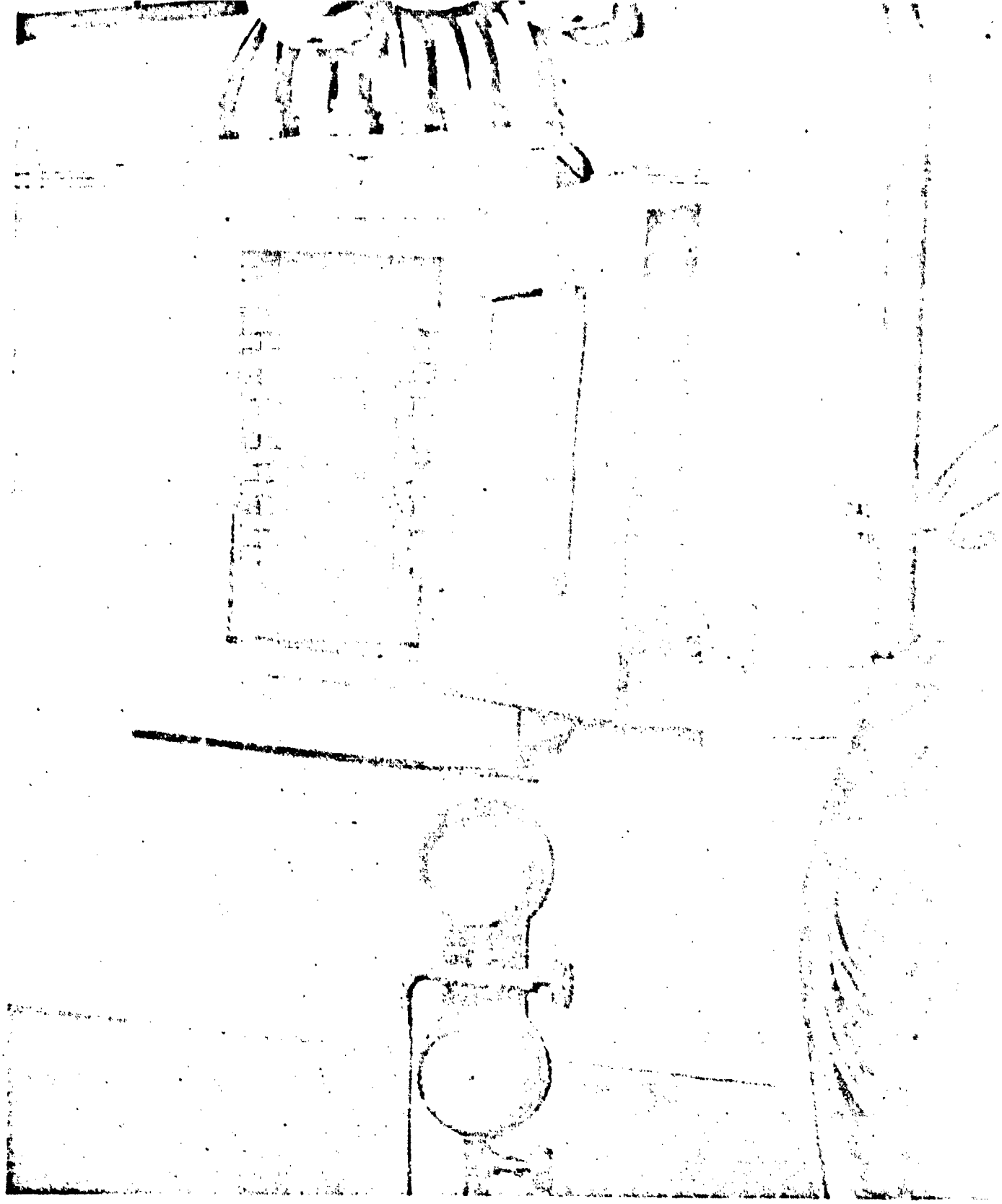
AB-CR-68-2983-11. Gyro compass. Shows damage to the gimbel mounting springs. Picture taken looking aft.



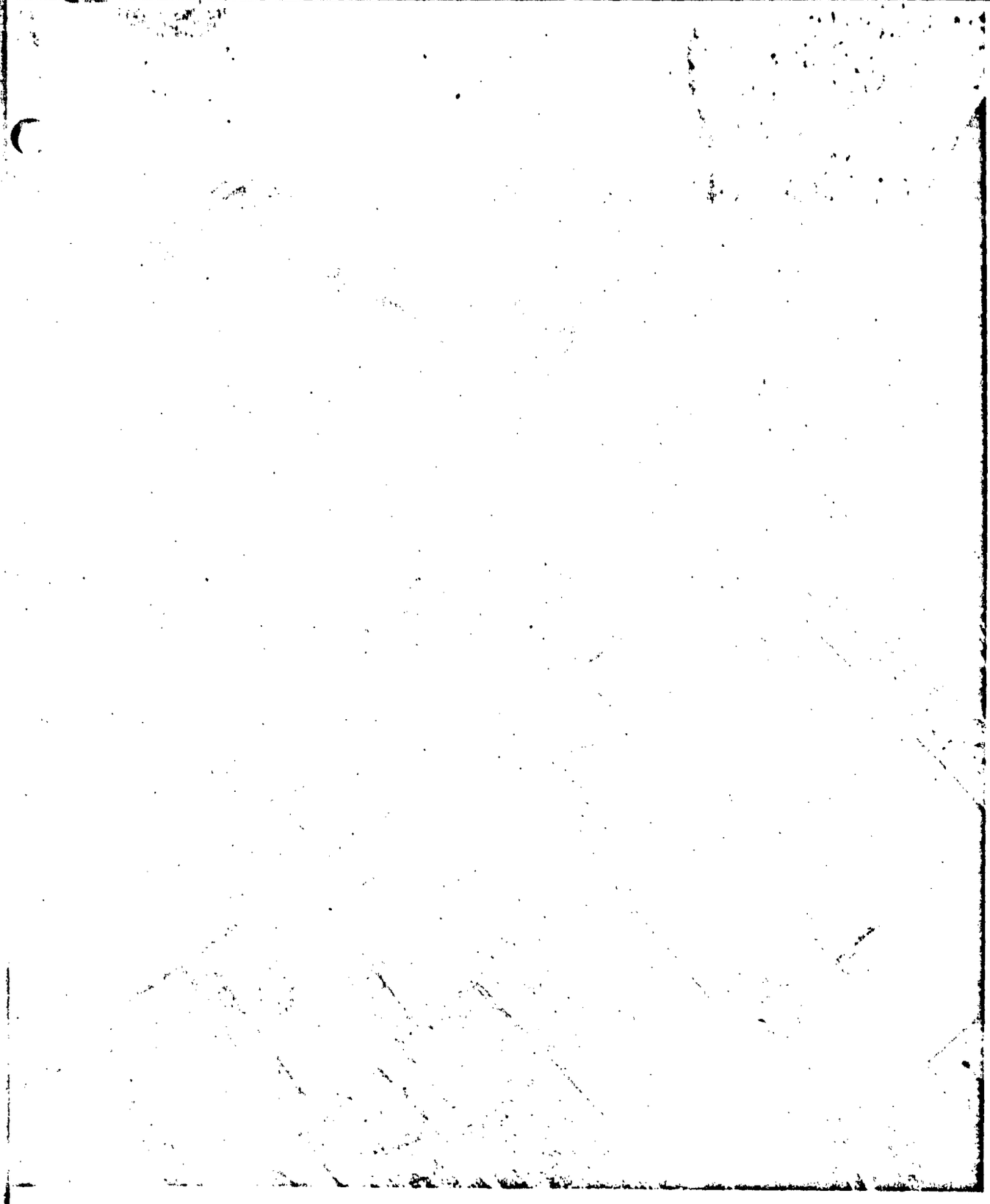
AB-CR-68-2984-1. Gage board for the port auxiliary diesel generator set. Shows board dislodged from the engine. Picture taken looking to port.



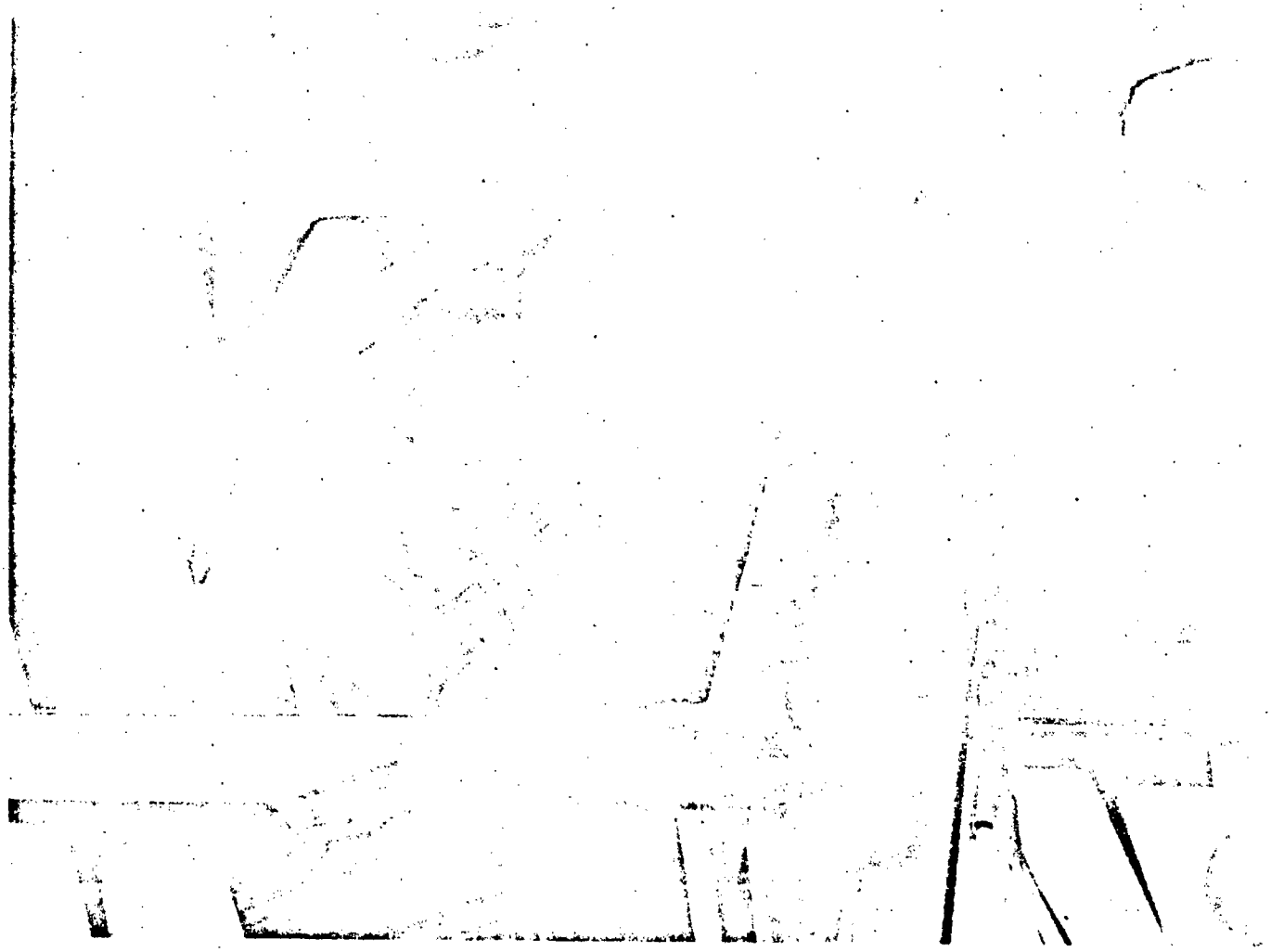
AB-CR-68-2983-12. Gyro compass battery rack in gyro room. Shows batteries dislodged from the rack. Picture taken looking to starboard.



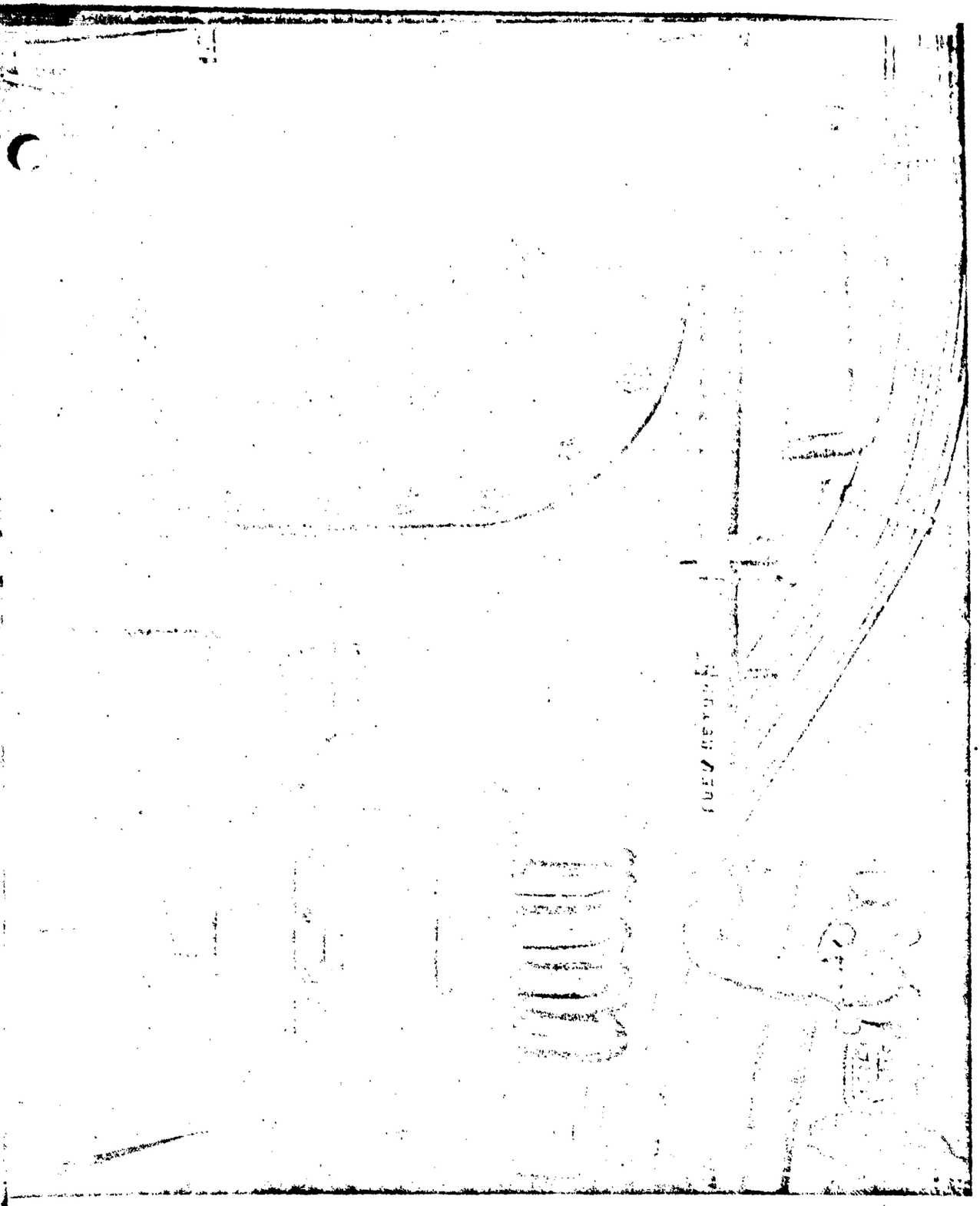
AB-CR-68-2984-3. Lighting distribution panel mounted in the auxiliary engine room. Shows damage to the front cover. Picture taken looking to port.



AB-CR-68-2984-5. Auxiliary diesel generator set foundation. Shows damage to the vibration mount. Picture taken looking down at the set.

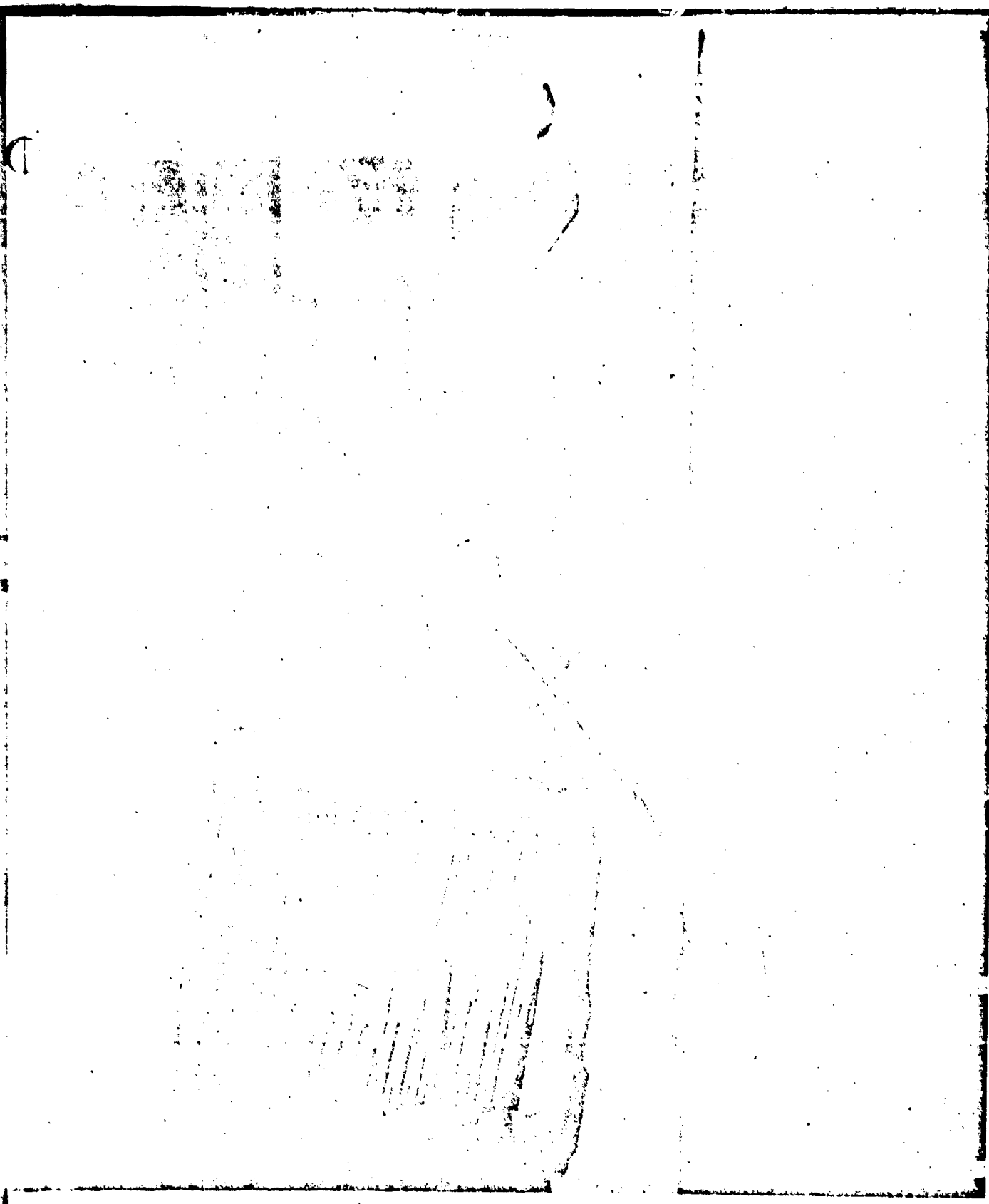


AB-CR-68-2984-8. Diesel generator set starting batteries. Shows batteries dislodged from their normal position. Picture taken looking to starboard.

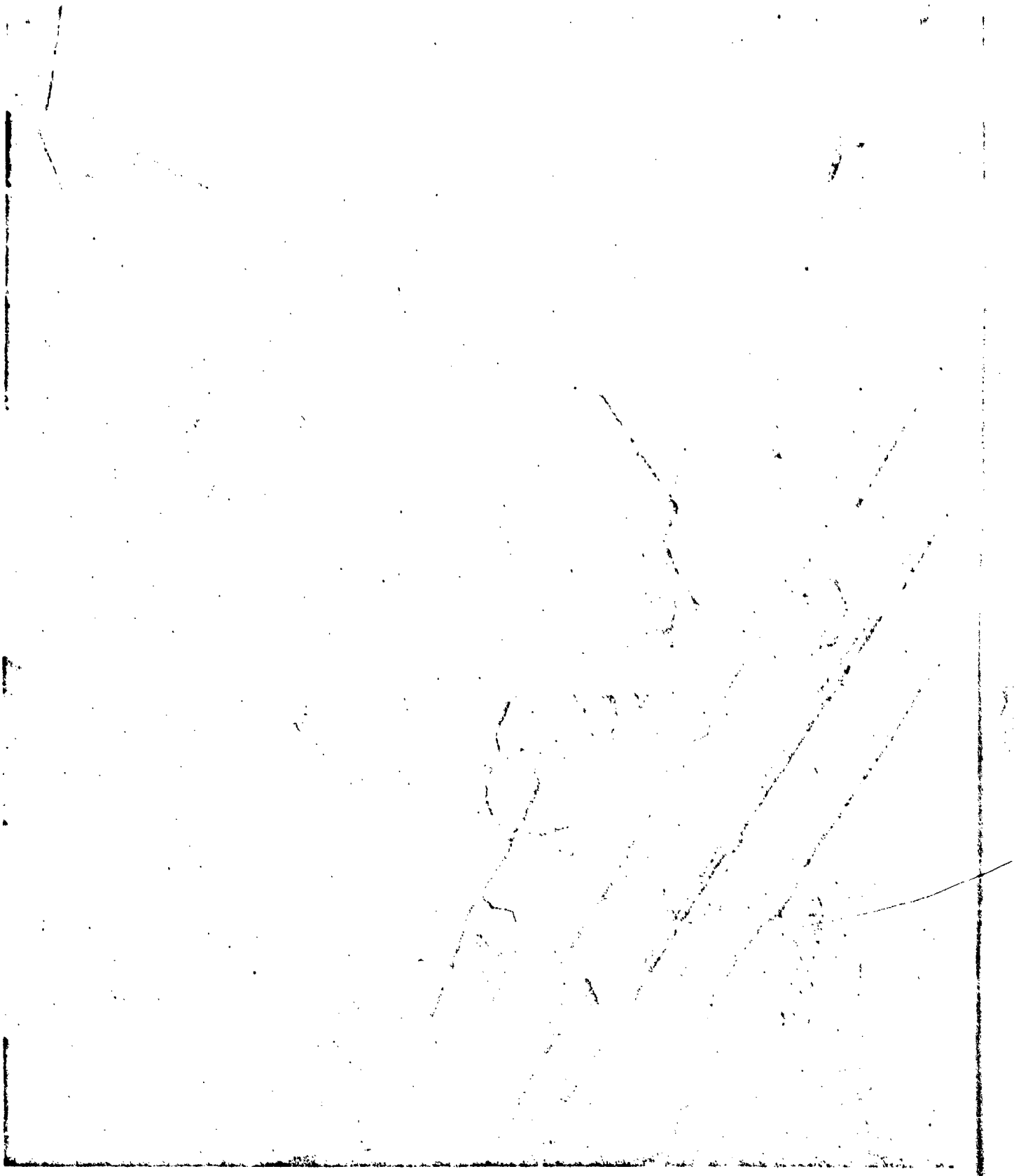


AB-CR-68-2984-9. Lube oil pressure alarm mounted in the auxiliary engine room. Shows alarm dislodged from its mounting. Picture taken looking forward.

AB-CR-68-2984-10. Fuel oil purifier motor controller, mounted in the auxiliary engine room. Shows armature for line contactor dislodged. Picture taken looking to starboard.

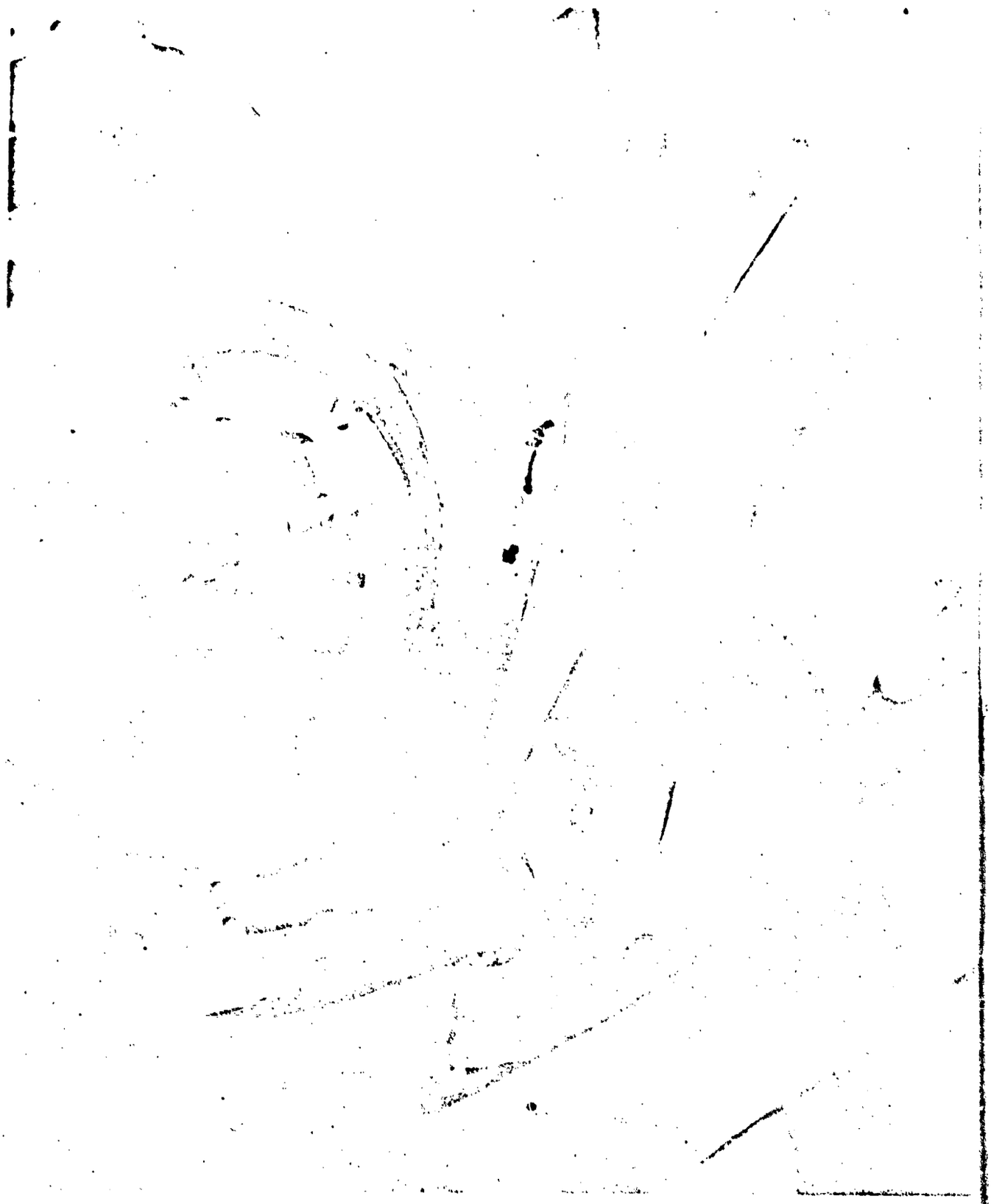


AB-CR-68-2984-11. Diesel generator set starting battery. Shows damage to the battery case. Picture taken looking forward.

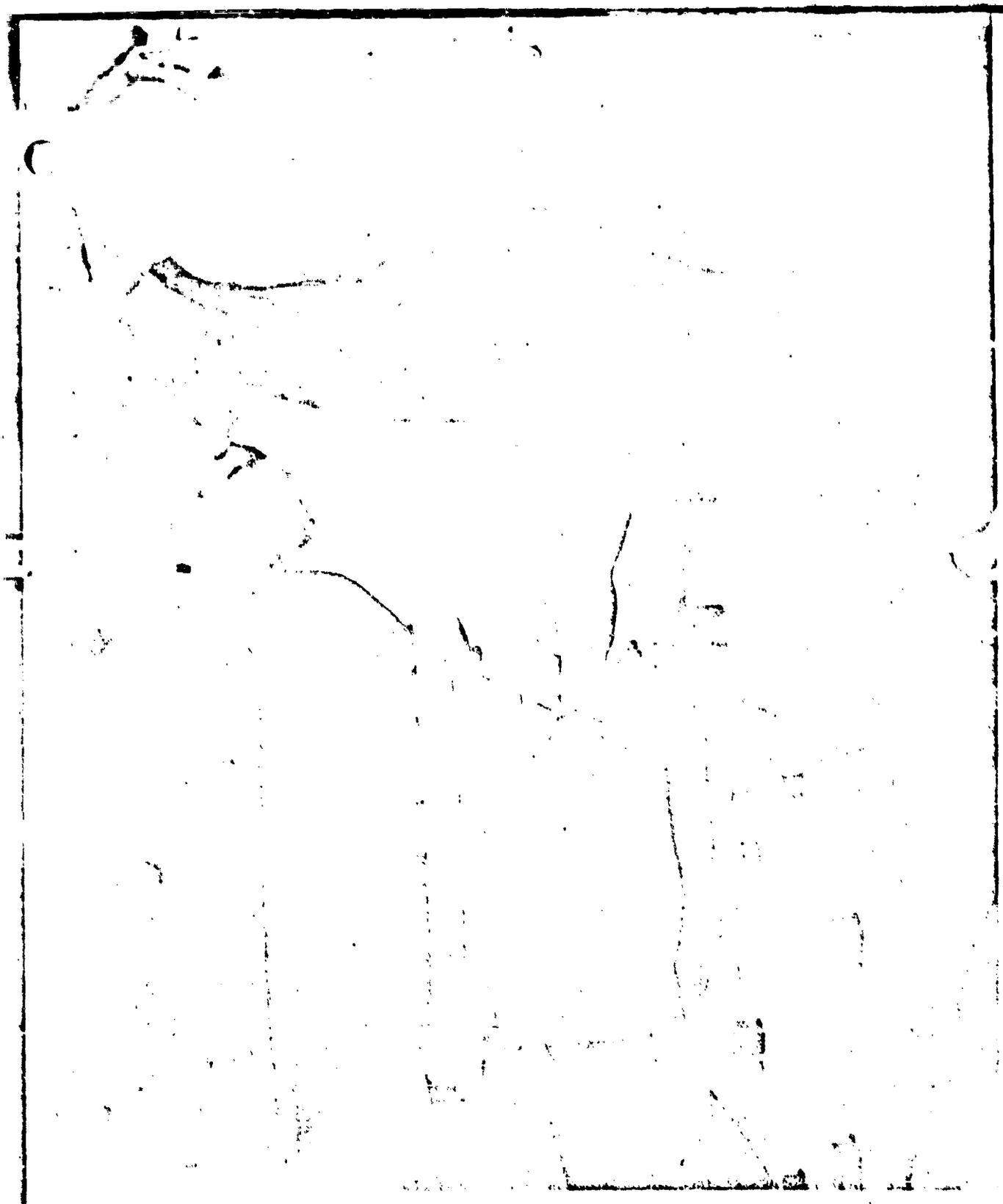


AB-CR-100-2991-10. Elevator motor mounted on the main deck. Shows speed reducer dislodged from its mounting.

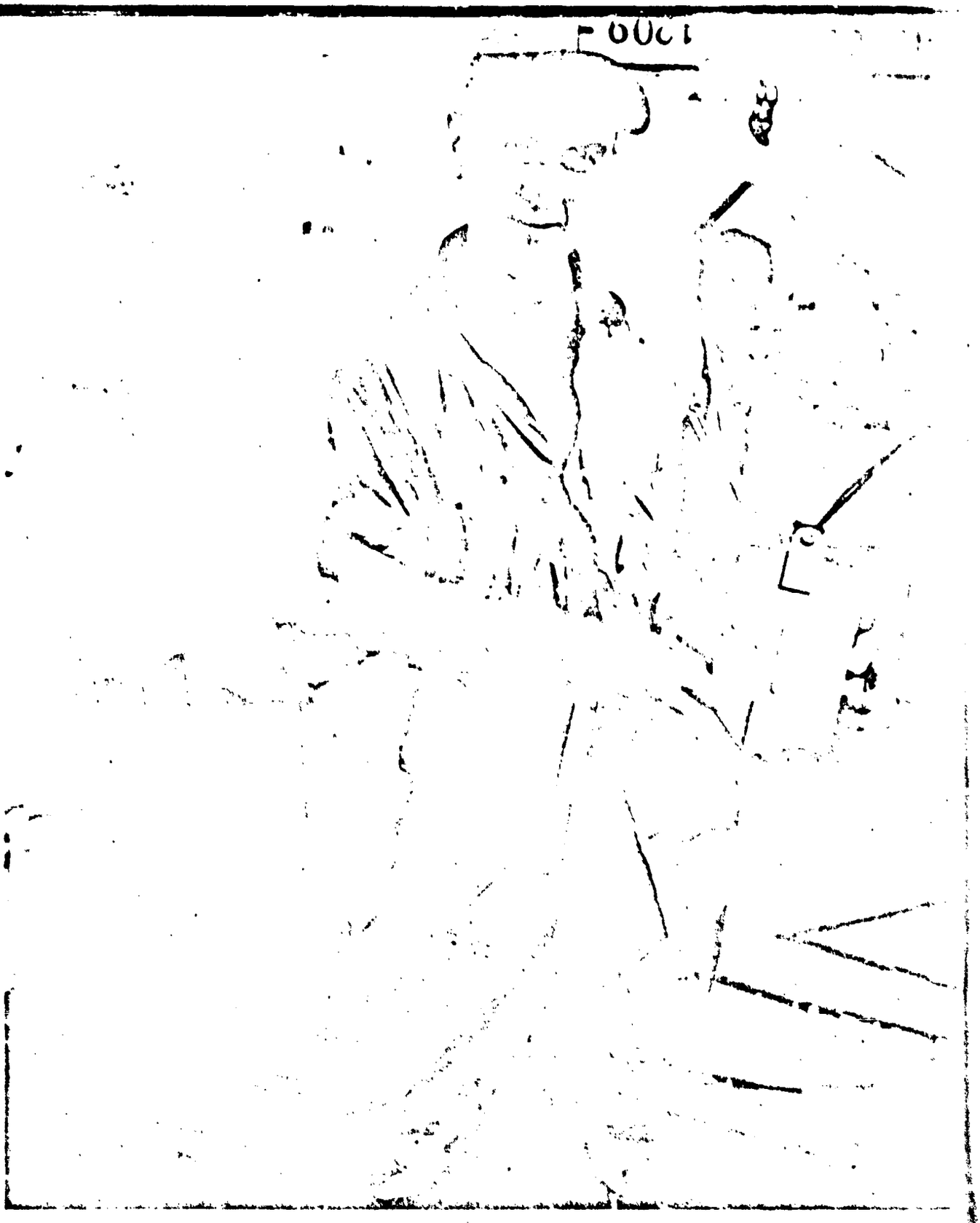
AB-CR-100-2991-11. Elevator motor mounted on the main deck. Shows motor dislodged due to leg failure.



AB-CR-100-4209-1. Forward starboard Welin boat davit mounted on the main deck. Shows motor broken off above the holding down bolts.

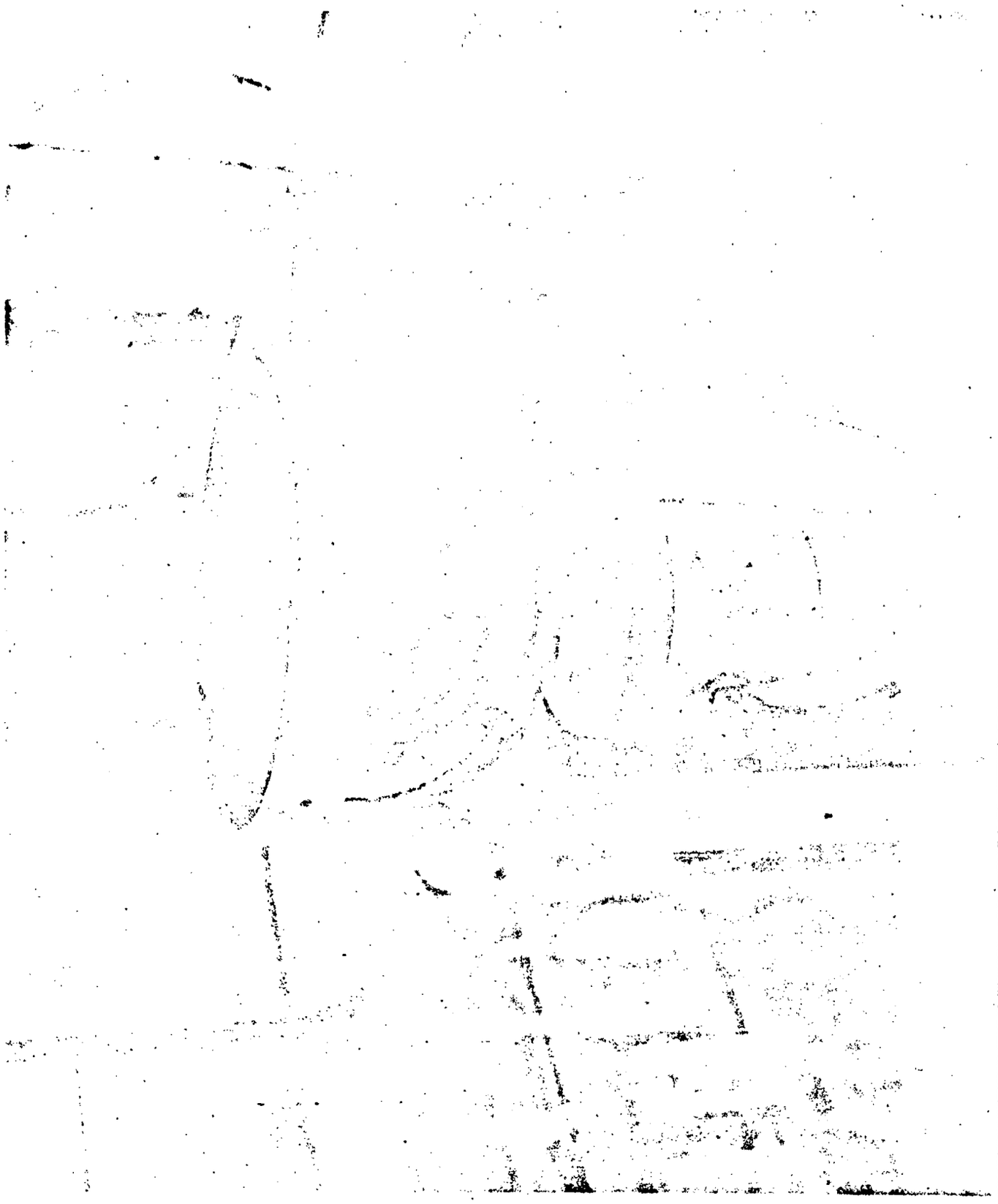


AB-CR-100-4209-2. After port Welin boat davit motor mounted on the Navigating Bridge. Shows motor cracked at the base.

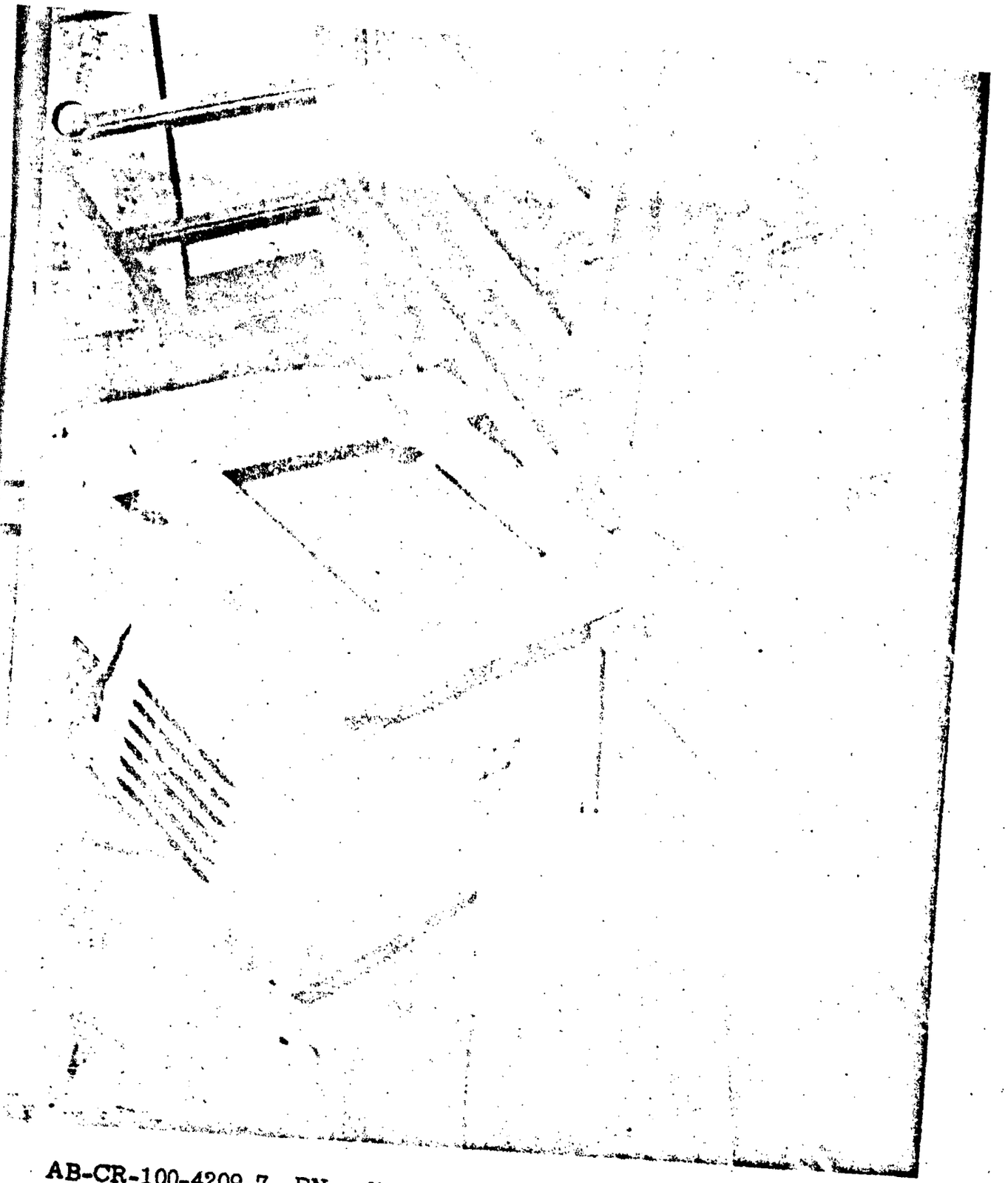


AB-CR-100-4209-3. Limit switch for the after starboard Welin boat davit mounted on the Navigating Bridge. Shows damage to the holding down straps.

AB-CR-100-4209-4. Standard magnetic compass mounted on the Signal Bridge. Shows compass knocked off the stand. Picture taken looking to port.



AB-CR-100-4209-5. Gyro compass repeater mounted on the flying bridge. Shows repeater dislodged from the gimbel ring. Picture taken looking forward.



AB-CR-100-4209-7. BN radio in chart house. Shows radio dislodged from its mounting, and on the deck. Picture taken looking aft.

SECRET

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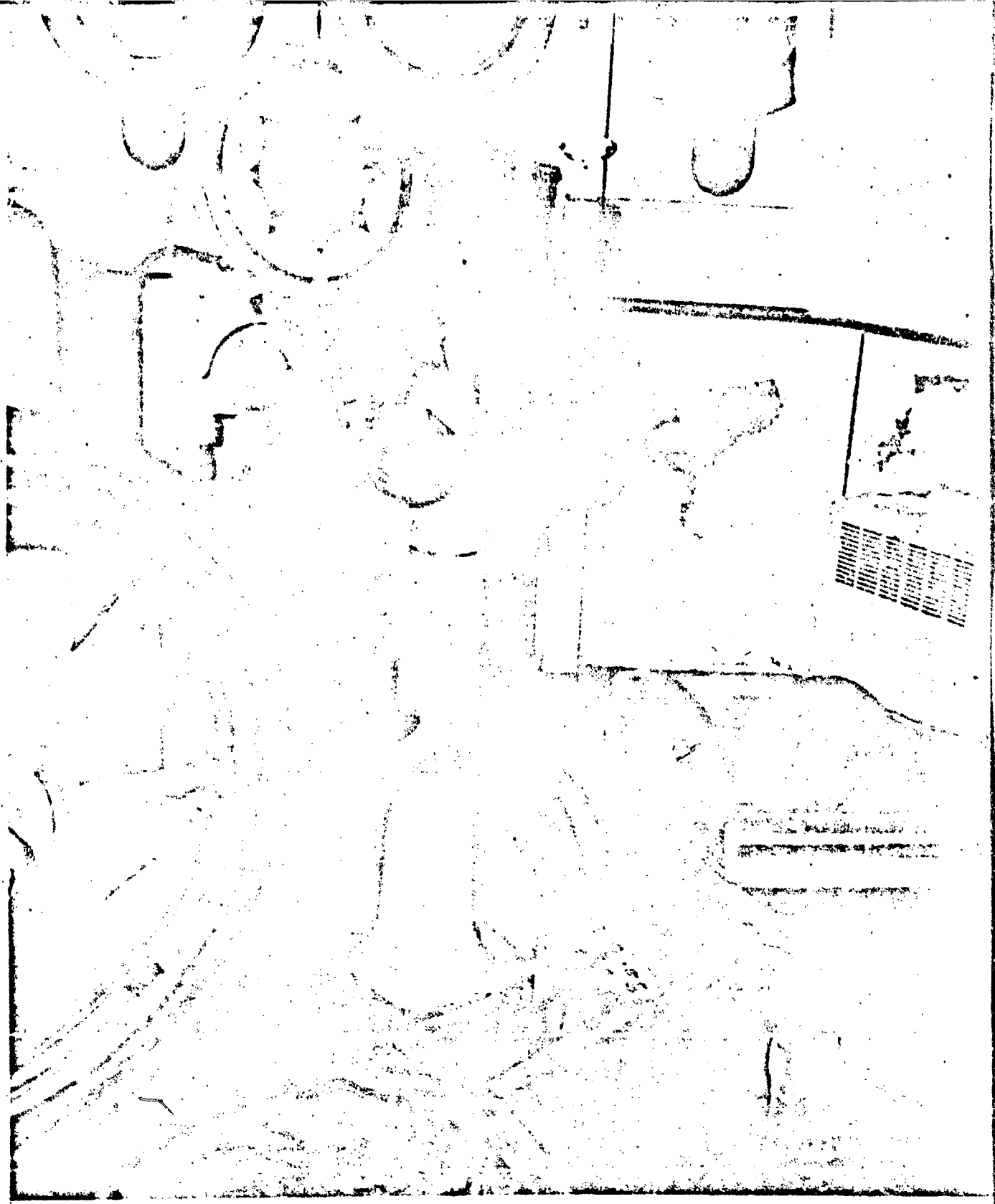
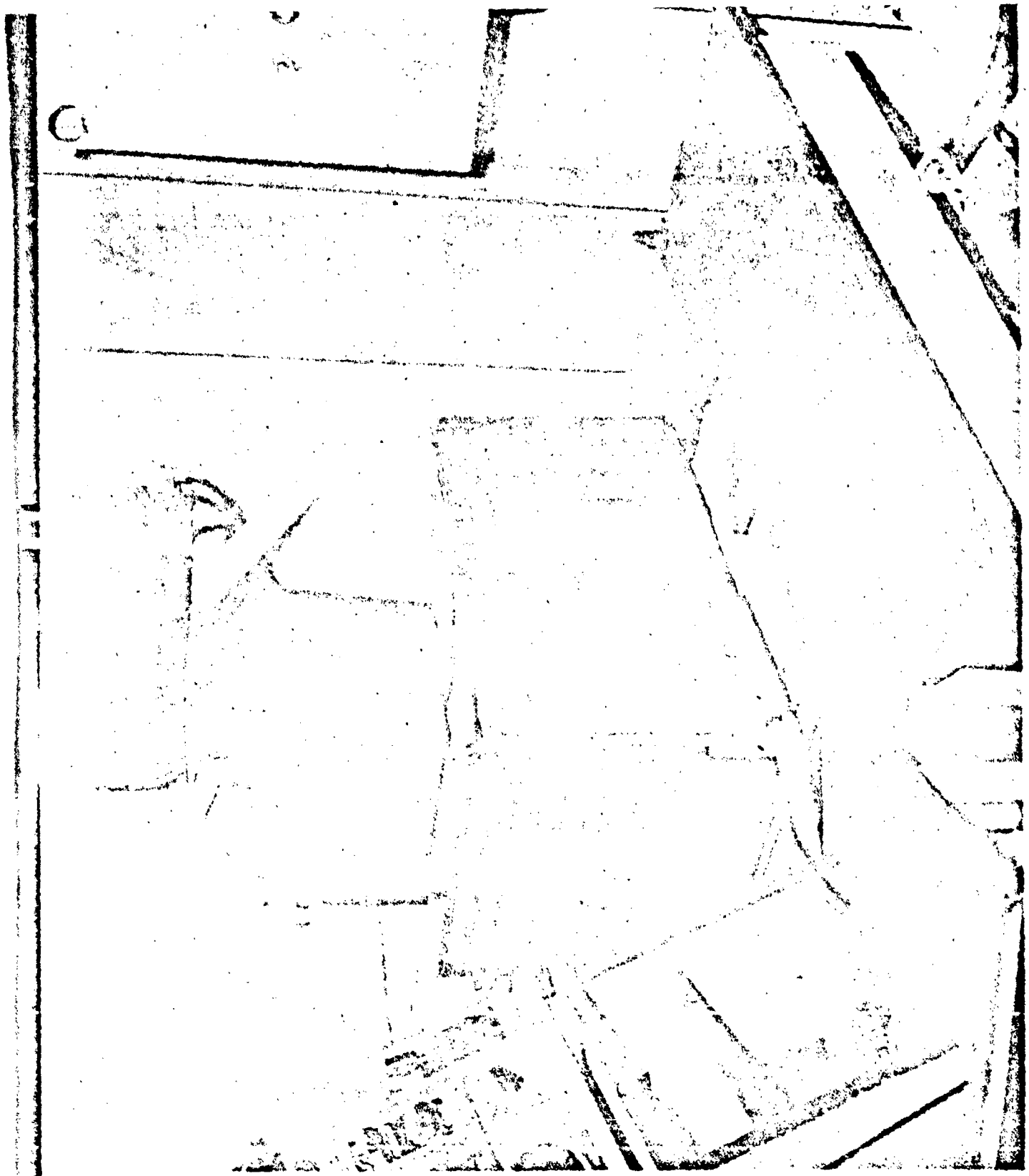
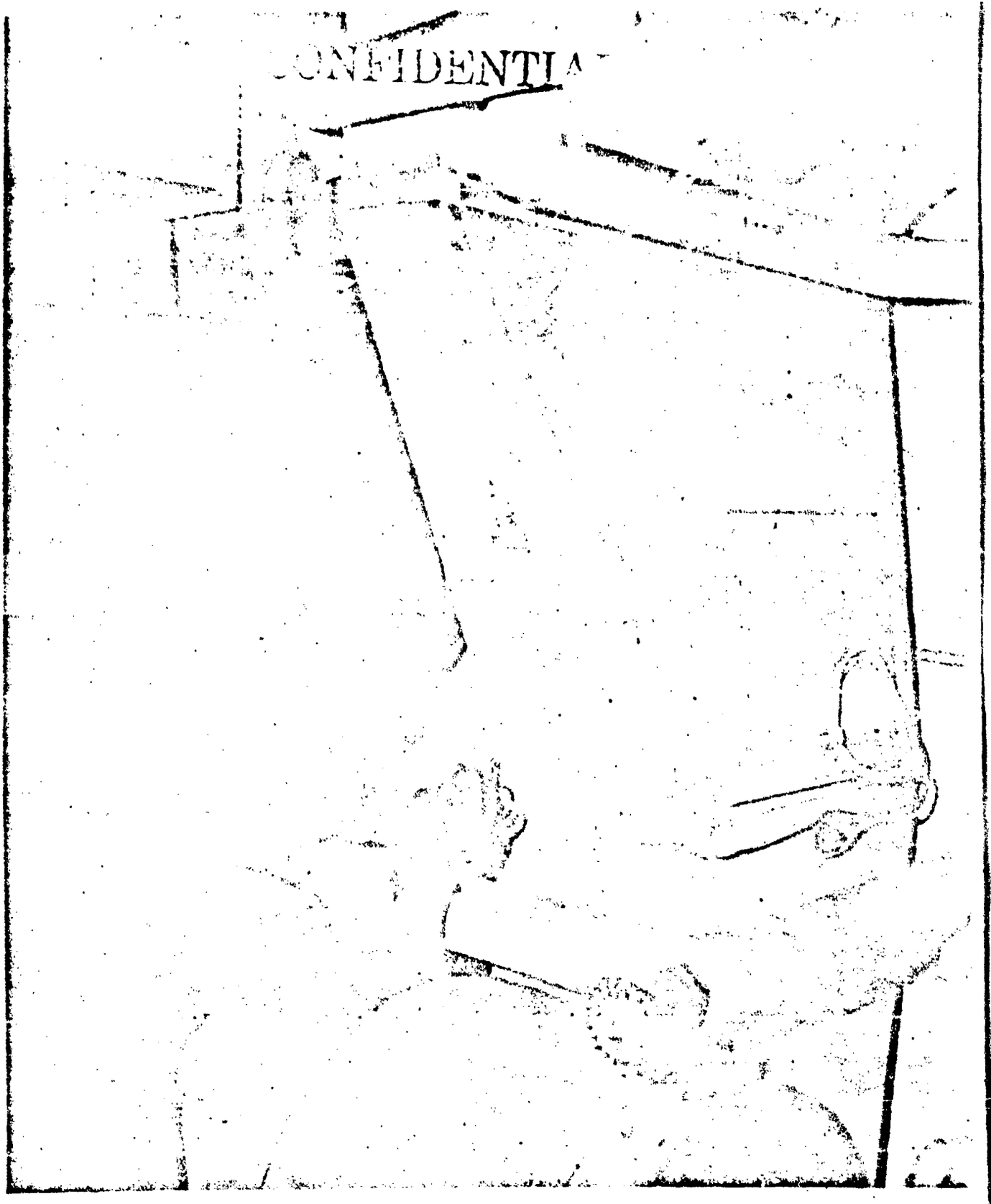


AB-CR-100-4209-8. Engine order telegraph in pilot house. Shows damage to the glass on the telegraph. Picture taken looking forward.



AB-CR-100-4209-9. Radio shack. Shows shock damage in this space. Picture taken looking to port.



AB-CR-100-4209-10. Motor controller for vent set 1-36. Shows motor controller being inspected for damage. Picture taken looking to starboard.

APPENDIX

COMMANDING OFFICERS REPORT

TEST BAKER

[redacted] UNCLASSIFIED

COMMANDING OFFICERS REPORT

REPORT #5

SECTION - I [redacted]

Major damage to LST 133 included forward elevator carried away, with locking pin in position.

Engine rooms were partly flooded due to water coming down vents and normal leakage from leaving ship unattended. Also the same for the shaft alleys. The bilge control room was flooded by water coming in from other ballast tanks through broken valves.

All gear lockers, desks, spare parts, batteries, etc., throughout the ship was knocked loose and blocked doors, hatches making it difficult to enter several compartments.

The No. 2 ballast pump motor and the No. 1 and 6 davit motors were knocked from their base.

[redacted] UNCLASSIFIED

Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

AD-366588	XRD-203-Section 12
AD-366589	XRD-200-Section 9
AD-366590	XRD-204-Section 13
AD-366591	XRD-183
AD-366586	XRD-201-Section 10
AD-367487	XRD-131-Volume 2
AD-367516	XRD-143
AD-367493	XRD-142
AD-801410L	XRD-138
AD-376831L	XRD-83
AD-366759	XRD-80
AD-376830L	XRD-79
AD-376828L	XRD-76
AD-367464	XRD-106
AD-801404L	XRD-105-Volume 1
AD-367459	XRD-100

TRC 18 April 1997

Subject: Declassification of Reports

AD-801406L ✓ XRD-114?

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

Ardith Jarrett

ARDITH JARRETT
Chief, Technical Resource Center